

# HANGAR CHATTER

BLIMP HEADQUARTERS SQUADRON THREE

NUMBER 4

SEPTEMBER 1944

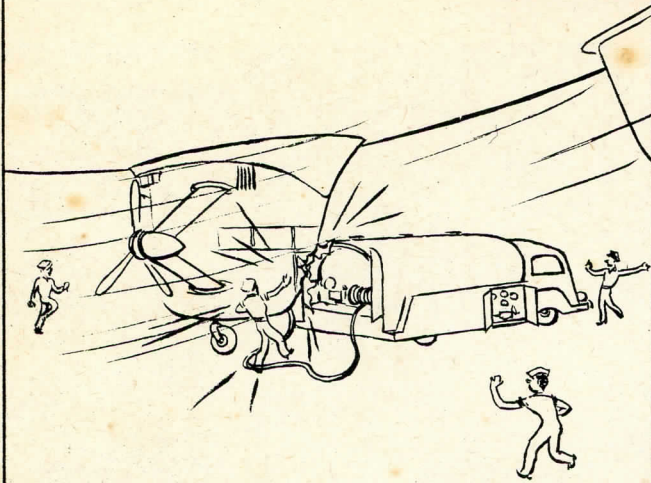


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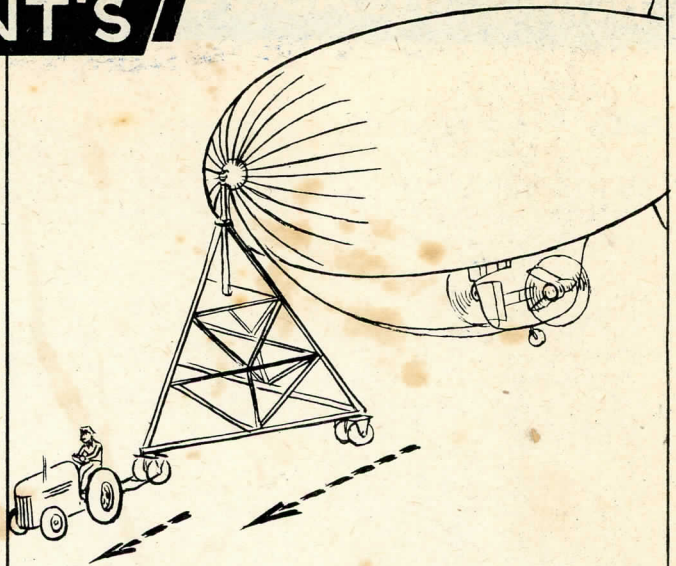


# HEDRON THREE

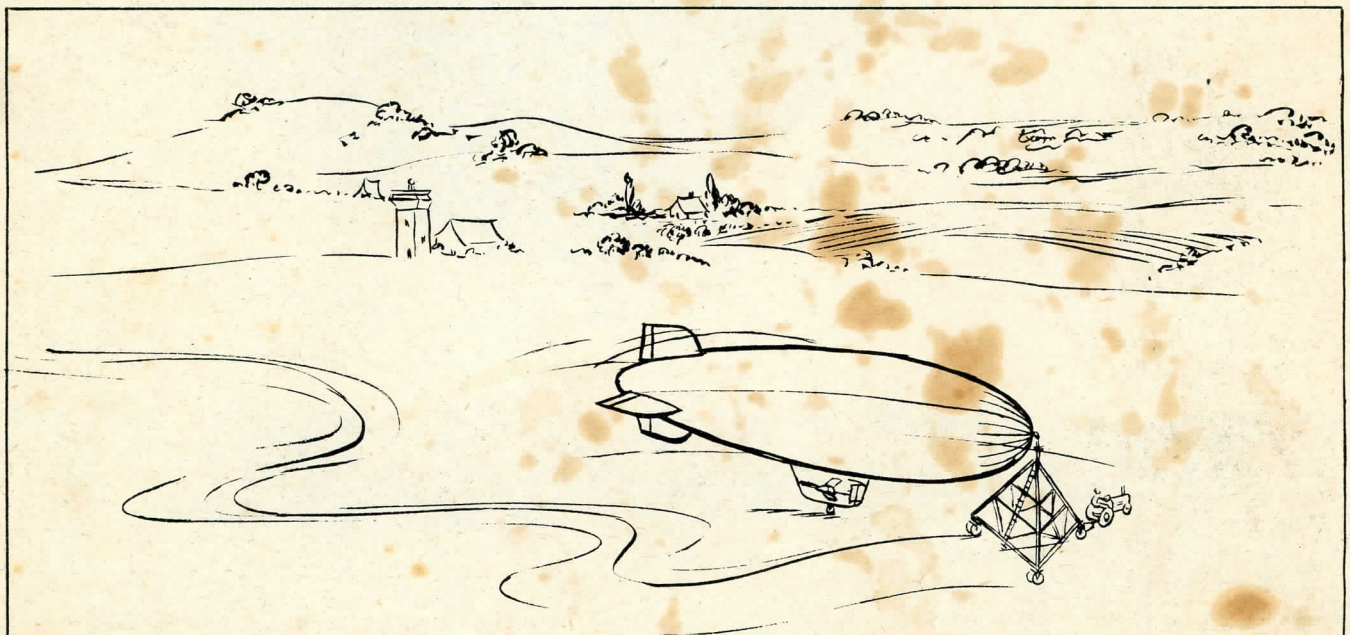
## DONT'S



DON'T GET TRUCKS TOO NEAR TO THE SHIP! SPOT THEM SO AS TO CLEAR THE CAR AND FIN.



DON'T SPOT THE TRACTOR AND MAST IN ANY POSITION EXCEPT IN LINE FORE AND AFT WITH THE SHIP WHILE WARMING UP THE ENGINES!



DON'T RACE OVER MAT, TURN OR STOP SUDDENLY! IT MAY STRAIN OR DAMAGE NOSE BATTENS, CONE OR LANDING GEAR!



# HANGAR CHATTER

## ADMINISTRATION

Commander V. L. Smith.....Commanding Officer  
 Lt. Comdr. R. H. Hobensack.....Aide to Commanding Off.  
 Lt. Comdr. P. L. DIXON.....Off. in Charge Det. 32  
 Lt. Comdr. Burr ODELL.....Off. in Charge Det. 33  
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This magazine is published monthly by and for the personnel of Hedron Three for the purpose of disseminating information on the maintenance of airships.

Lithographed at Moffett Field, California

## DETACHED

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 Lieut. H. Kuechler

## PROMOTIONS

### ZASU - 31

Lieut. J. F. Leonard  
 Lieut. D. W. Patterson  
 Lieut. (J.G.) D. P. Salden

### ZASU - 32

Lieut. J. F. Bishop  
 Lieut. J. F. Marsh, Jr.  
 Lieut. J. P. Kennedy

## FIRST AID

There is no feeling so bad as that helpless feeling when a man is accidently injured and the men around him are ignorant of the methods of first aid. All hands should acquaint themselves with at least the bare rudiments. It is intended to hold classes of instruction on this subject some time in the near future within the ZASU's and AF-ZASU's. The following procedures shall be adopted by personnel attending victims of accidents of any kind:

1. Persons arriving first at the scene of an accident, aircraft or otherwise, must give first aid at once to the injured, controlling severe hemorrhage, applying temporary dressings or giving artificial respiration, pending the arrival of the Medical Officer. First aid boxes will be found in various conspicuous places around the the hangar.

2. Injured personnel must not be moved from the vicinity of an accident without direction from proper medical authority. Undue haste in transporting accident victims to a hospital may react unfavorably on the patient's chances for survival.

Rest before removal from the place of the accident is advisable to permit some degree of recovery from shock resulting from the injuries.

During this period medical assistance can be summoned and preliminary first aid administered by those already present.

3. The dead must not be removed without the Coroner's permission except in instances of personal agreement between the County Coroner and the Medical Officer.

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## AVIATION TRAINING PAMPHLET

Some of the new type training pamphlets which have been so widely publicized in various magazines, have been received by this command. Any man with an aviation rate may borrow any of these books by merely asking his ZASU Training Officer.

The list below are the books already received.

Introduction to Airplanes  
 Blueprint Reading and Layout Work  
 Hand Tools  
 Fundamentals of Electricity  
 Aircraft Radio Equipment  
 Aircraft Communications  
 Aircraft Metals  
 Aircraft Welding  
 Airplane Structures  
 Aircraft Hydraulic Equipment  
 Aircraft Engines  
 Aircraft Fuel Systems  
 Aircraft Propellers  
 Aircraft Fire Control  
 Parachutes



## GASOLINE

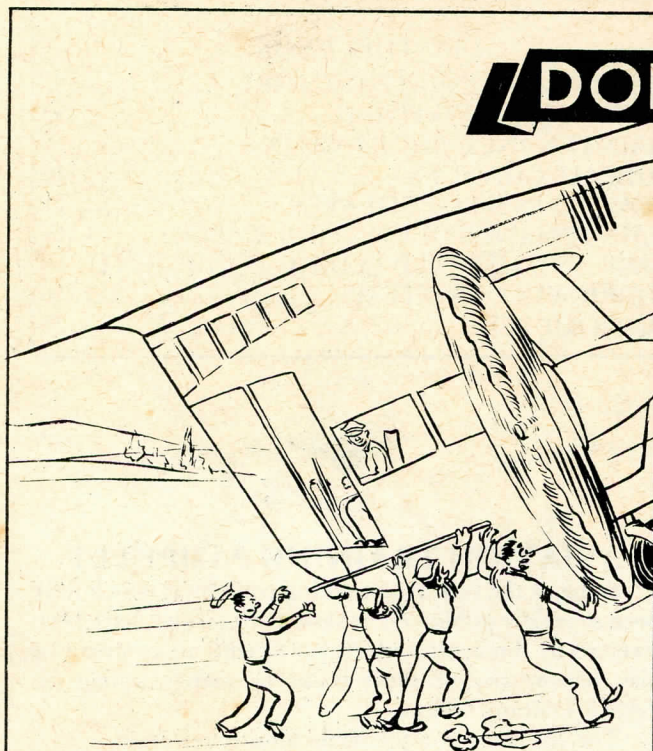
Naval personnel who are on leave 72 hours or more will be entitled to receive special gasoline rations of one gallon for each day of leave up to a maximum of 30 gallons.

Ration currency may be obtained from local OPA boards upon presentation of original copy of leave papers which will be endorsed by the boards to indicate the ration issued. Application should be made to local boards in the community where the automobile to be driven is located and should be accompanied by satisfactory evidence of the identity of the automobile the applicant intends to use. Personnel traveling under official travel orders in which delay is authorized en route, which will be charged against annual leave, may present such travel orders in lieu of leave papers in making application to local boards for special gasoline rations.

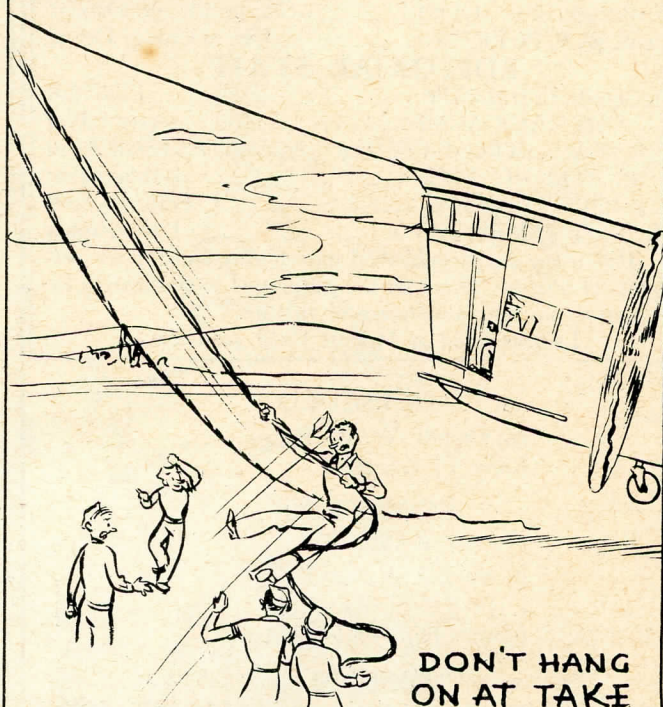


# HEDRON THREE

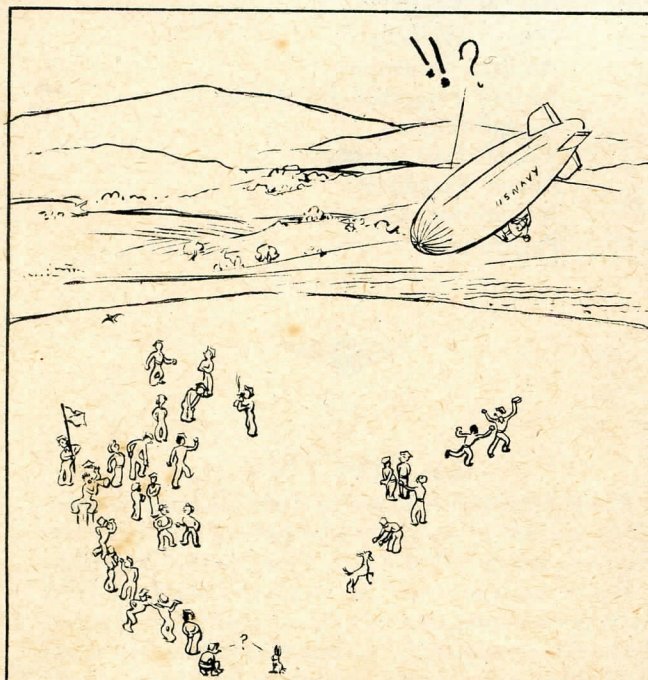
## DONT'S



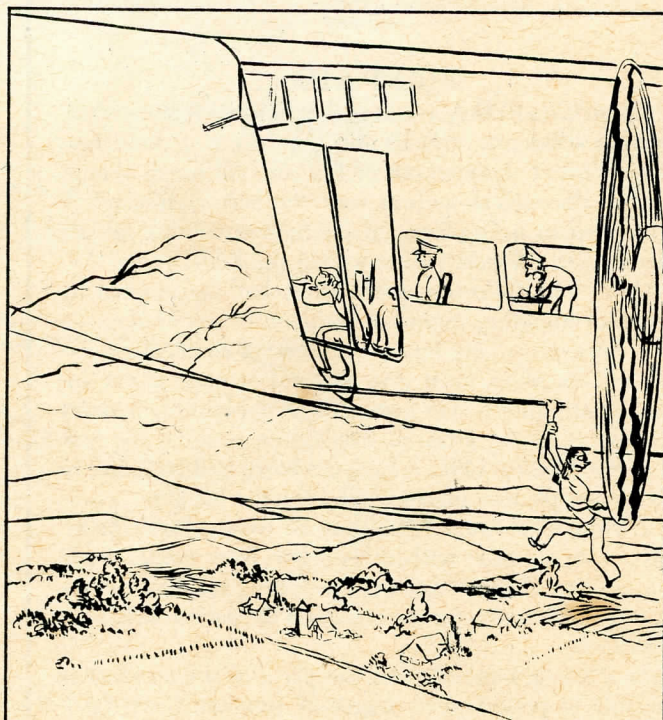
**DON'T FORGET THE PROP WHEN ON THE CAR PARTY!**



**DON'T HANG ON AT TAKE OFF. DROP YOUR LINES IMMEDIATELY WHEN THE ORDER IS GIVEN!**



**DON'T CONTRIBUTE TO A RAGGED V!**



**DON'T LET YOUR FEET LEAVE THE GROUND IF THE SHIP RISES! YOU MAY COME DOWN THE HARD WAY!**



# HANGAR CHATTER

## NEWEST VETERANS' BILL

The most recent bill dealing with aid to veterans of this war has just become law with President Roosevelt's signature.

Technically it is known as Public Law No. 346, 78th Congress.

A summary of its provisions follows:

(1) Appropriation for additional hospitals for veterans, for mutual use of Army and Navy veterans.

(2) Also, veterans will be supplied artificial limbs and trained in their use in the above institutions.

(3) Army and Navy will establish boards for review of type and nature of contested discharges from the armed services (except discharges by sentences of general court martial). Review may be requested by the veterans or next of kin, or by the Government.

(4) Education for veterans who entered the service under the age of 25, or, if older, can prove that their service "impeded, delayed, interrupted, or interfered with" their education, the Government will pay up to \$500 a year for tuition and other fees and books; \$50 a month for subsistence without dependents, \$75 a month with dependents.

(5) Loans for purchase or construction of homes, farms and farm equipment and business property. The Government will guarantee 50 per cent of the amount of the loan, the guarantee not to exceed \$2,000, and the rate of interest not to exceed 4 per cent for a period not to exceed 20 years.

(6) Unemployment compensation of \$20 a week for not less than 24, nor more than 52 weeks, minus any wages in excess of \$3 a week.

## BE CAREFUL WITH ALLOTMENT CHECKS!

The U. S. Secret Service and the Twelfth Naval District Public Relations Officer have issued the following protective suggestions to prevent thieves from stealing allotment checks from servicemen's dependents.

Clip this out and send it home to the folks. These thieves must be stopped.

1. Be at home, or have a member of your family at home, when checks are due to be delivered. Get your checks immediately upon delivery.

2. Be sure your name is printed clearly on your mail box with a good lock to prevent theft.

3. Cash your checks in the same place each month. This will simplify identifications.

4. Do not endorse your checks until you are in the presence of the person you will ask to cash them.

Other suggestions for retail merchants and business men have been issued:

1. When a stranger asks you to cash a check, insist that he properly identify himself as the rightful payee of that check. Know your endorser.

2. Before cashing any check for a stranger, ask yourself this question: "If this check is returned because of forged endorsement, can I locate the forger and recover my loss?"

3. If a check is already endorsed when it is presented to you, insist that it be endorsed again in your presence and compare the handwriting.

4. Have all checks initialed by the employees who pay out the money for them.

## ADVANCEMENT IN RATING

The following named men have been advanced or changed in rate in August.

### HEDRON ADMINISTRATION

Griswold, C. L.

PhM2c to Phm1c

Parker, E

StM2c to StM1c

### ZASU - 31

Spallina, W. J.

S2c to S1c

Sclafani, P. F.

S2c to S1c

Siembab, C.

S2c to S1c

Sidore, P.

S2c to S1c

Chapman, R. W.

S2c to S1c

Rodgers, K. R.

S2c to S1c

Wolfe, C. F.

S2c to S1c

Van Caster, W.

S2c to S1c

Waterson, R. T.

S2c to S1c

Spicer, S. G.

S2c to S1c

Schneider, F. L.

S2c to S1c

Frey, J. T.

CK3c to CK2c(T)

McQuay, J. D.

StM2c to StM1c

Thompson, B. L.

StM2c to StM1c

Burse, G.

StM2c to StM1c

Robinson, J.

StM2c to StM1c

### ZASU - 32

Cramer, V. F.

BM2c to AR2c(T)

Whalley, J. R.

BM2c to AR2c(T)

Manis, R.

AM3c to AR3c(T)

Smith, H. R.

AM3c to AR3c(T)

Soreng, J. E.

S1c to ART3c(T)

Madaris, R. R.

S2c to S1c

Tremie, D.

S2c to S1c

Kinsey, L. E.

S2c to S1c

Randall, C. E.

S2c to S1c

Elson, L. J.

S2c to S1c

Stalder, D. C.

S2c to S1c

Taylor, J. R.

S2c to S1c

Tomassetti, M. B.

S2c to S1c

Bayze, T. F.

S2c to S1c

Sprague, R. G.

S2c to S1c

Tracy, P. E.

S2c to S1c

Roundtree, V. L.

S2c to S1c

Streeter, J.

S2c to S1c

Clancy, D. J.

S2c to S1c

Foster, A. B.

S2c to S1c

Tarp, E. A.

S2c to S1c

Letterly, E. T.

S2c to S1c

Showers, E. L.

S2c to S1c

Summy, C. H.

S2c to S1c

Marsh, H. W.

S2c to S1c

Johnson, R. E.

S2c to S1c

Smith, C. C.

S2c to S1c

Richie, J. W.

S2c to S1c

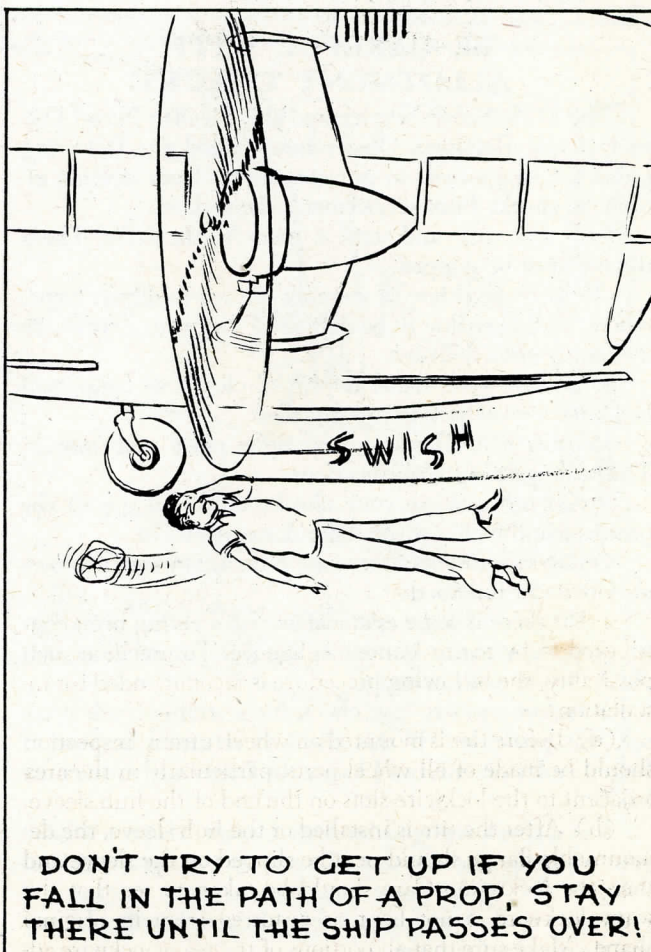
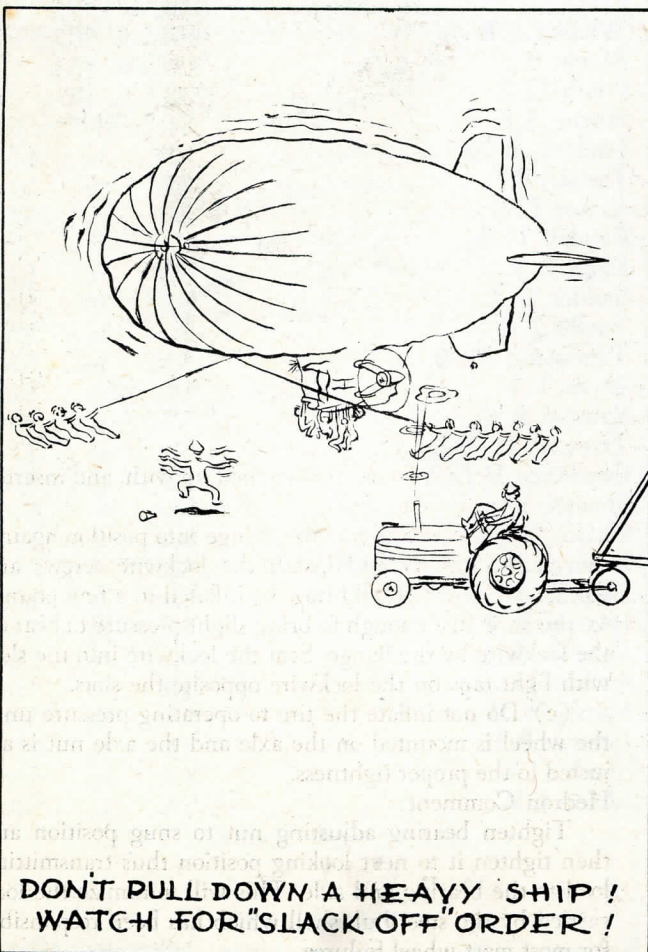
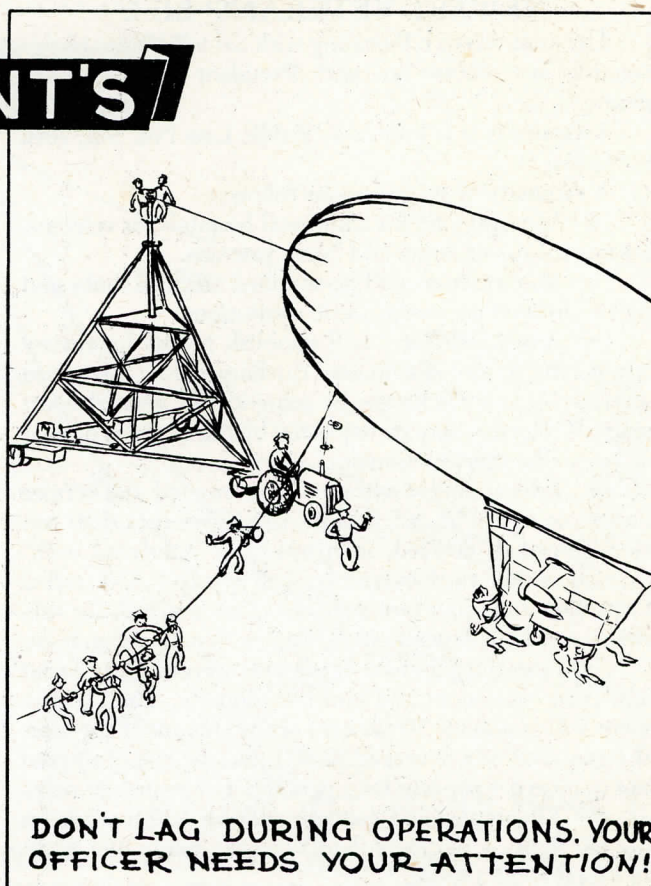
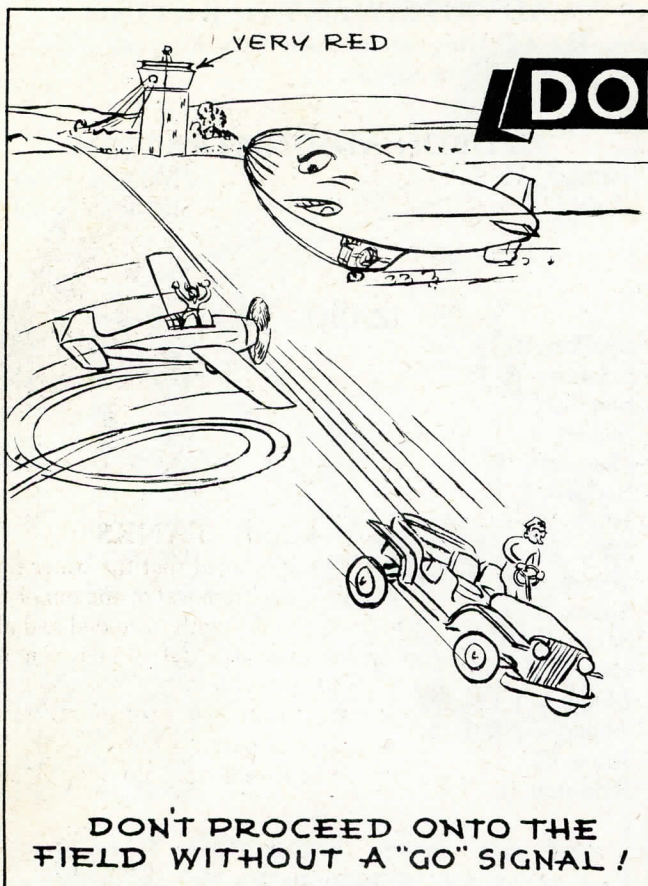
### ZASU - 33

Shannon, G. W.

AR2c to AR1c

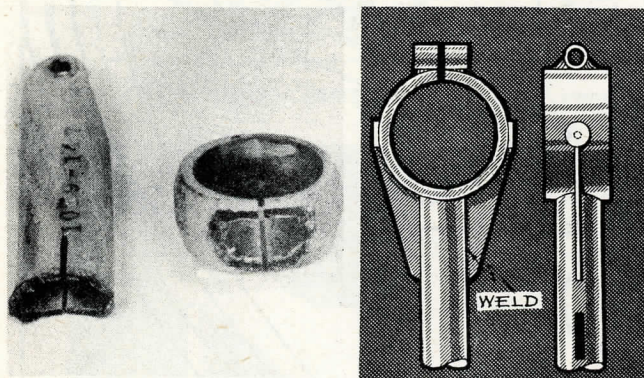


# HEDRON THREE





# HANGAR CHATTER



Breaking of the air-scoop opening arm as indicated in the picture should be eliminated by Moffett Field, Local Change No. 42.

This change incorporated the addition of a gusset welded on each side of the arm to give added strength—as shown in sketch.

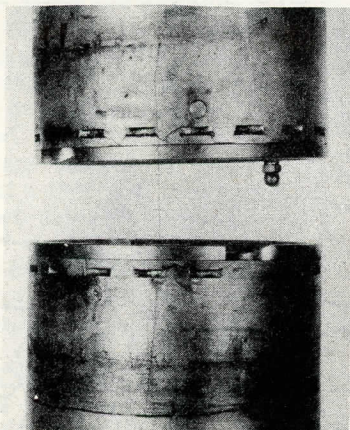


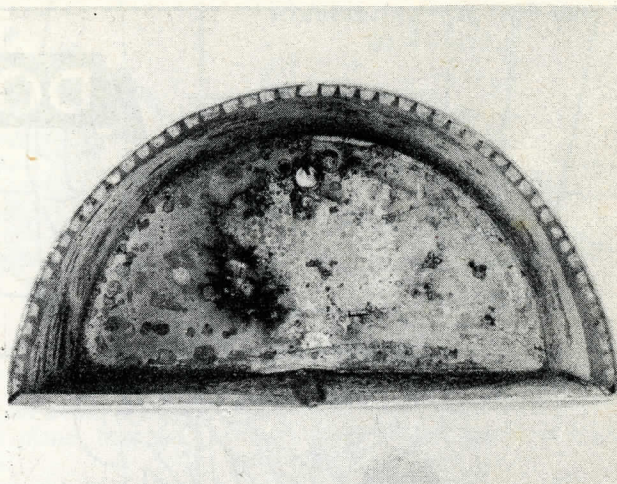
Figure 1 shows a mooring mast wheel hub prior to failure, but in a dangerous condition. Figure 2 shows a wheel hub after failure has occurred.

To be inspected and serviced in the following manner:

Goodyear reports that a study of mast hub failures indicates that there is some evidence of their having been contributed to by maintenance negligence. To preclude such possibility, the following procedure is recommended for installation:

(a) Before tire is mounted on wheel, careful inspection should be made of all wheel parts, particularly in the area adjacent to the lockwire slots on the end of the hub sleeve.

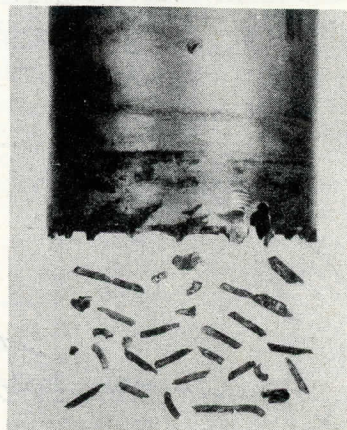
(b) After the tire is installed or the hub sleeve, the demountable flange should next be slipped on the sleeve and then the lockwire. Care should be taken to see that the wavy lockwire is not bent or distorted from its original shape. Make sure that all portions of the wavy lockwire ad-



## DIRTY WATER TANKS

During an inspection it was noted that the water tank had a very strong bad odor; upon removal of the top of the tank, the interior was found to be highly corroded and also had many spots that looked to be bacterial colonies or molds (see above photo).

Tanks shall be washed thoroughly every 120 hr inspection, with a solution of one part of Clorox to ten (10) parts water and thoroughly rinsed until no odor or taste remains.



## FAILURE OF MAST WHEEL HUBS

adjacent to the hub sleeve are matched up with, and inserted into, a lockwire slot.

Next, lift the demountable flange into position against the wavy lockwire and install the lockwire screws and washers. The tire should now be inflated to a few pounds air pressure, just enough to bring slight pressure to bear on the lockwire by the flange. Seat the lockwire into the slots with light taps on the lockwire opposite the slots.

(c) Do not inflate the tire to operating pressure until the wheel is mounted on the axle and the axle nut is adjusted to the proper tightness.

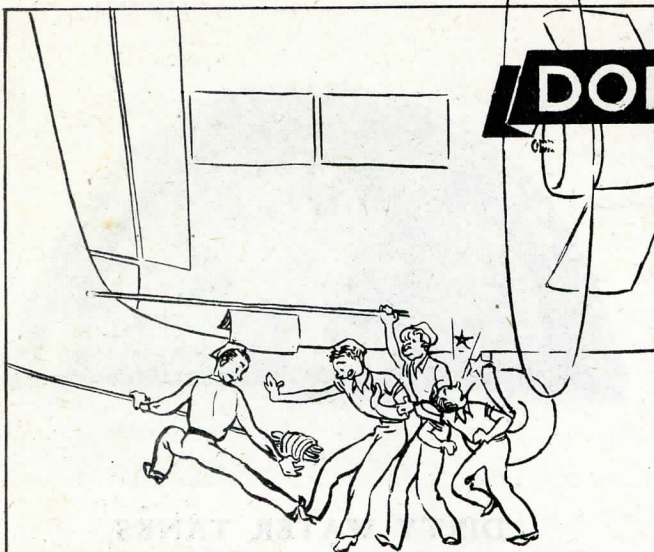
Hedron Comment:

Tighten bearing adjusting nut to snug position and then tighten it to next locking position thus transmitting load to the bearing and axle. This will minimize the load carried by the steel hub shell which has been responsible for most mast wheel failures.

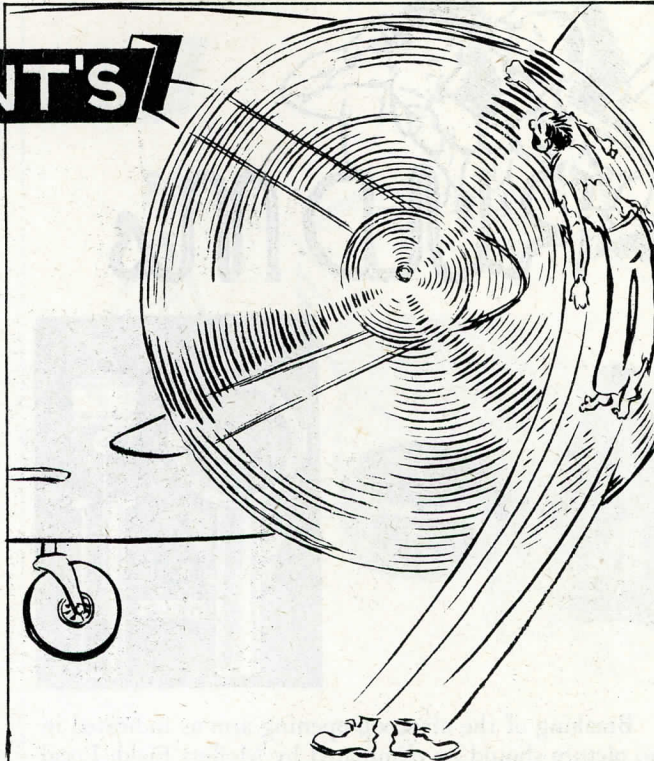


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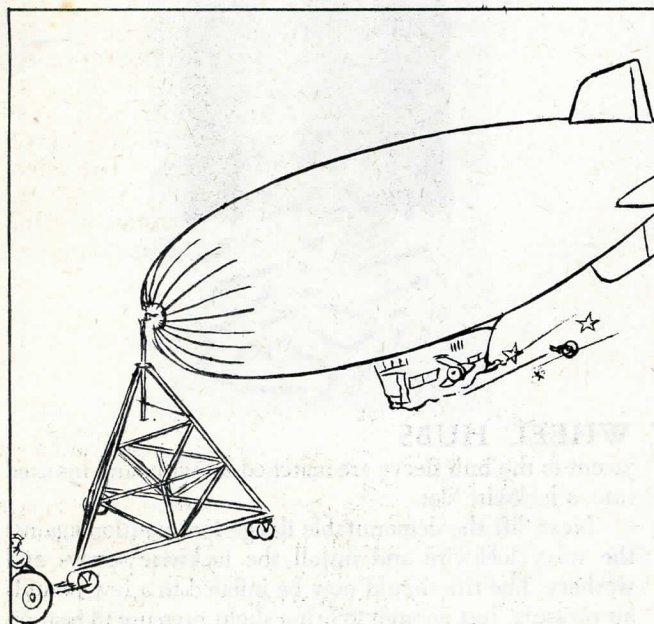
## DON'T'S



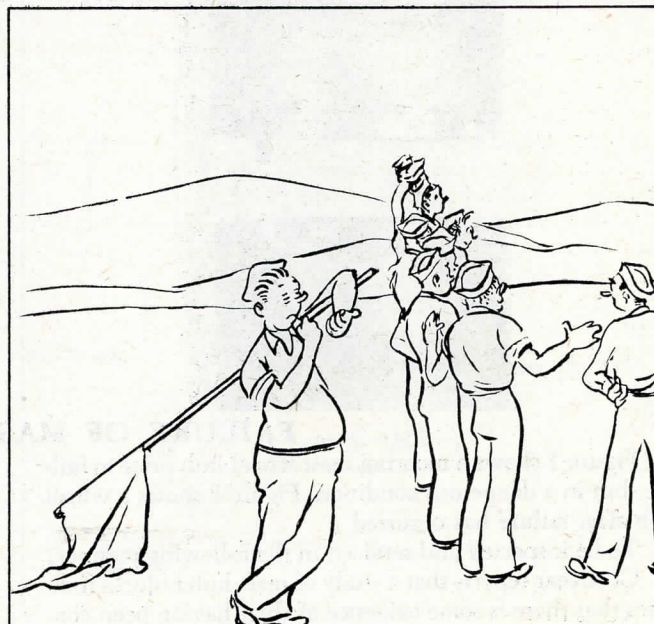
**DON'T PULL THE LONG LINES OUT  
IF THE SHIP IS ON THE WHEEL!  
AND MOVING!**



**DON'T TRIM THE PROP UNTIL  
SIGNALLED THAT THE 'SWITCH IS OFF'!**

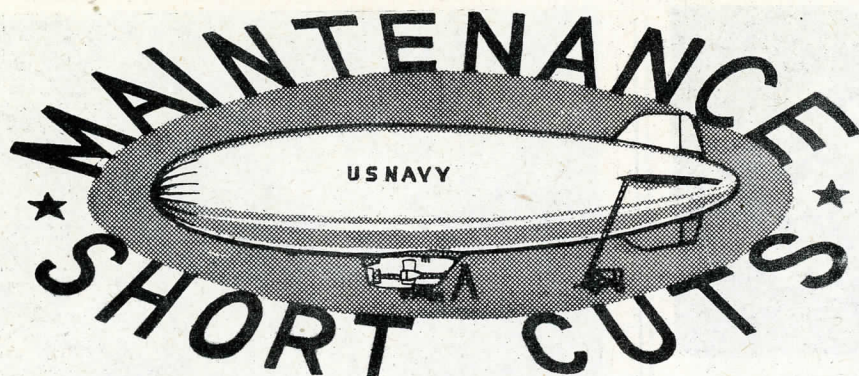


**DON'T FORGET TO UNLOCK THE  
WHEEL BEFORE MOVING THE SHIP!**

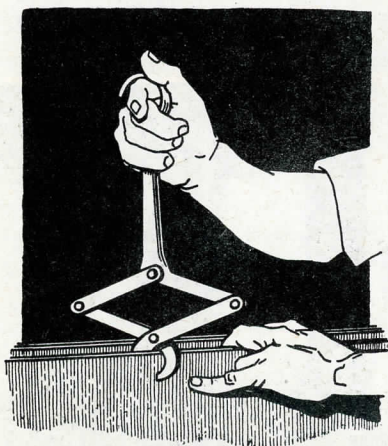


**DON'T LAG WITH THE FLAG!  
HOLD IT UP!**





### Paint Shop Clamp

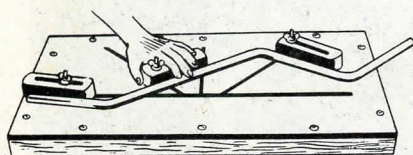


This clamp for holding sheet stock has increased the handling of priming sheets from 30 an hour to 50 in in one case. Formerly, sheets to be primed were stacked on an "A" rack two at a time, and then turned over as each side was finished.

The "A" rack procedure has been eliminated by this "ice tong" clamp which has corrugated jaws and a hooked handle. These clamps hold the sheets throughout the priming process. The sheets are strung by the clamps on poles and painted, first one side and then the other. Still handled by the clamps the sheets are moved to a drying rack.



### Checking Tubing



This adjustable fixture is used for checking tubing, but its principle might be applied to other adjustable checking devices. It can be adjusted to fit numerous conditions. How-

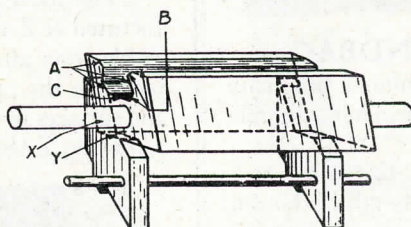
ever, complex bends, or bends which do not lie in a flat plane, may be beyond its capacities.

Through additions and improvements other applications are possible. It may be built, for instance, to check tubes bent at an angle to its surface. Or, the fixture might be extended in size in order to check tube lengths.



### Milling Machine Holding Device

Groove milling with a staggered-tooth side-and-face cutter instead of a form cutter may be accomplished with this holding device. A very heavy cut was necessary in milling the groove shown with a form cutter. The result was that the cutter

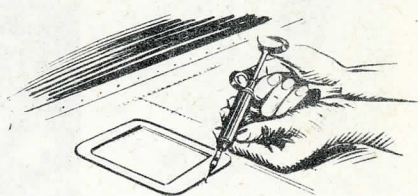


Milling Machine Holding Device

was soon dulled. Then, regrinding the cutter changed its dimensions, and careful readjustment of the miller was necessary.

First, a slot the width of "C" is milled out. Then the surface "C" is milled to desired dimensions. Surface "X" of the locating device is finished to be parallel to the proposed surface "A" when the piece is in position. Surface "Y" is at 90 degrees to "X." The V in the locating device is cut so that when the piece is in position, the "B" surfaces are vertical and are machined as an end milling operation. Turning the piece end for end, surfaces "A" are then machined in a similar fashion.

### Eliminating Air Bubbles in Fabric



A hypodermic needle has been used with most satisfactory results in eliminating air bubbles or pockets which form under fabric in repair patching.



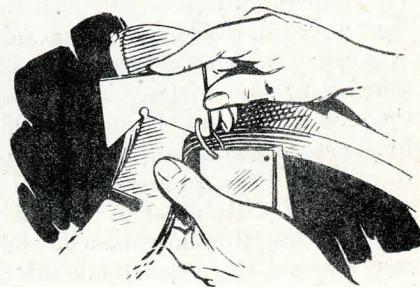
### Small Hole Paint Cleaners

The cleaning of paint and varnish from shaft centers and small holes by the use of center drills which become worn and dull, but which are not badly chipped or broken, has been practiced with considerable success. Drills of the same size as the holes to be cleaned are selected. The tool is placed in a small holder and turned by hand. The dull cutting edge scrapes off the softer material without scoring the metal.

Worn drills were formerly discarded and scrapers were used for cleaning. This operation was difficult because a hard baked varnish had to be removed without damaging the shaft centers. The adoption of worn drills for this work has minimized the possibilities of damage and has speeded up the cleaning job.

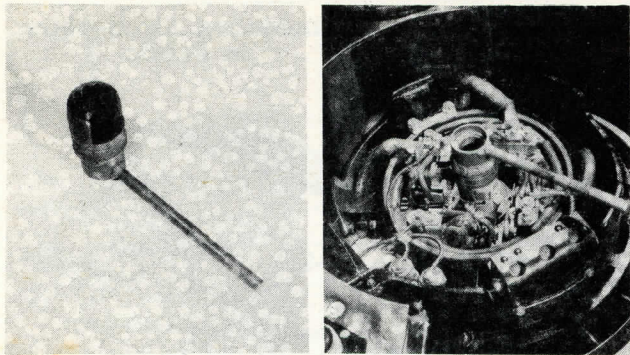


### Degree Plates



A quicker and simpler means of locating degrees is possible by use of these degree plates, a set of six degrees, open or closed, in the handforming department in place of a protractor. Necessity of using the more complex protractor is eliminated.

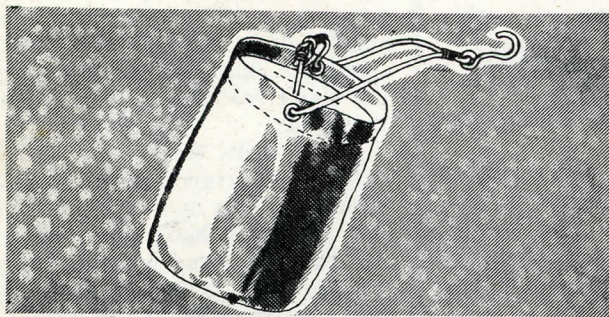




### LAWRANCE TOOL WRENCH

The above photograph represents a handy tool designed for timing of Lawrance unit. It is made to slip over the front crankshaft nut and still allow the starter drum to engage the crankshaft. Timing procedure is the same excepting that instead of turning the crankshaft the opposite direction of normal rotation with an open end wrench, the handle provided on the wrench serves the same purpose. The wrench allows faster timing of the Lawrance and also prevents burring of the front crankshaft nut. It is made of a 1 1/8" short socket that has been drilled and cut as shown on enclosure (A) with a 1" collar welded on and a 5" piece of round stock 3/8" welded on.

Parker, R. L., AMM1c, ZASU-33



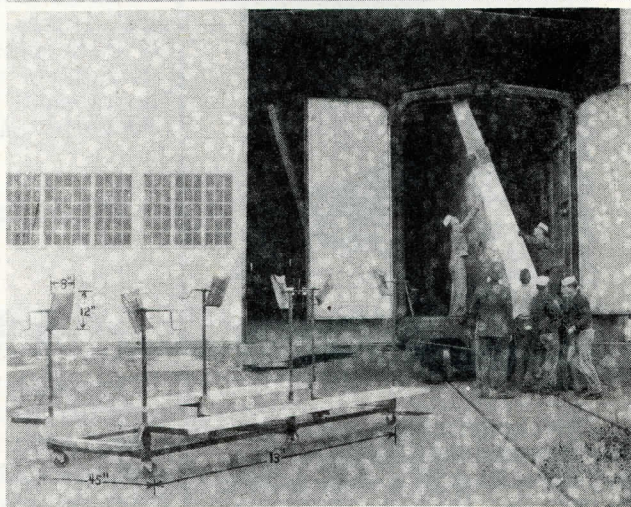
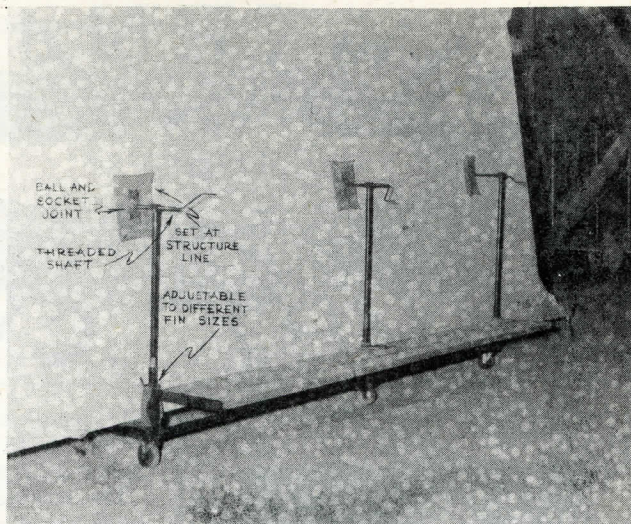
### NEWLY DESIGNED SANDBAG

The following designed sandbag combines simplicity with practicability. ZASU-33 has found them more durable than the conventional sandbag.

"Made from #4 medium gray duck, 42" wide; stock number 24-D-568. Cut a piece from the length of the roll 32" long, fold over and sew the two cut ends together and the bottom, sewing one half inch back from ends. Turn bag inside out, fold edges of top side of bag and sew to within five inches of one end (this is left unsewed for filling with sand and to be sewed by hand after bag is filled with the required amount of sand). It will hold from 40 to 50 lbs. as desired. The bag should be sewn along the blue thread line. Place #3 grommets four inches from ends at top of bag. Use the usual 1/2" cotton white line and hook. It is suggested in threading the white line through the grommets one end lead through one side of the grommet and the other end lead through the opposite side of the other grommet and tied in a square knot. This prevents twisting of the bag. Squeeze the bitter ends of line to main part of line.

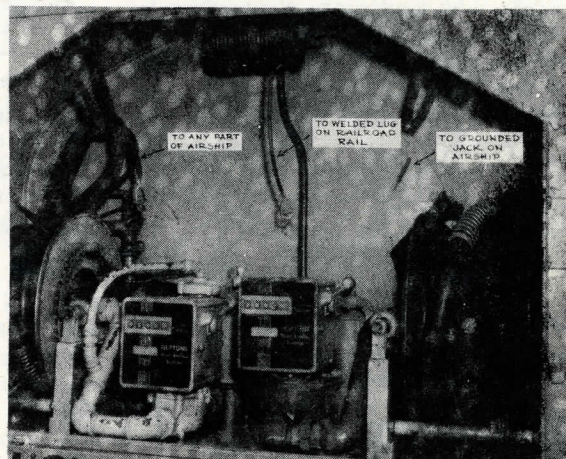
A finished bag should be approximately 19 1/2" long and 14 1/2" wide. After bag is filled and sand entrance sewn, turn bag upside down to permit sand to fold over inside edges of top.

Bos'n Brandes, ZASU-33



### CONTROL SURFACES JIG

The above photographs show a jig designed and manufactured at ZASU-33 for airship fins and control surfaces. Aside from affording a convenient means of transporting surfaces, the principal value is the convenience of repairing surfaces in the jig. - Ens. E. E. Collins and Carp. R. W. Crowder; ZASU33.



### FUEL TRUCK GROUNDING SYSTEM ZASU - 33

The above photograph shows the grounding system installed on the fuel trucks of ZASU-33.





### REPLACING A HELIUM VALVE

The following method is used in changing a gas valve with the type of hood made by the A & R Dept. of Moffett Field. In some cases with two experienced riggers, changing a gas valve can be accomplished in as little time as one hour and forty five minutes with this method.

1. All external fittings on the gas valve are removed and the hold down nuts are loosened before the hood is placed over the valve.

2. Cement the hood to the envelope around the valve.

3. Tie off the end of the hood furthest away from the valve.

4. Arm holes are provided in the hood for both riggers to place their arms inside and begin removing the nuts.

5. After the nuts are removed, the valve is then taken off the retainer ring and brought to the other end of the hood. The retainer ring is not removed unless possibly one of the studs needs replacement. This whole operation can be watched by the riggers through the glass inspection port provided in the hood.

6. The hood is then tied off near the envelope and the gas valve is passed out of the hood after the other tie-off is untied.

7. A new gas valve is then passed up and into the hood. The tie-off is again retied on the ends and the tie-off nearest the envelope is untied. The valve is then put in place on the retainer ring and the hold down nuts are then hand tightened.

8. After the hood is removed from the side of the envelope, the hold down nuts are then tightened by a wrench and the proper setting is made on the valve.

### REMOVAL OF STARTER

ZASU-32 recommended using this method of removing the starter from engines.

1. Remove electrical leads from accelerating motor.

2. Disconnect generator brace from starter brace.

3. Remove starter crank extension.

4. Disconnect hand meshing cable from bell crank.

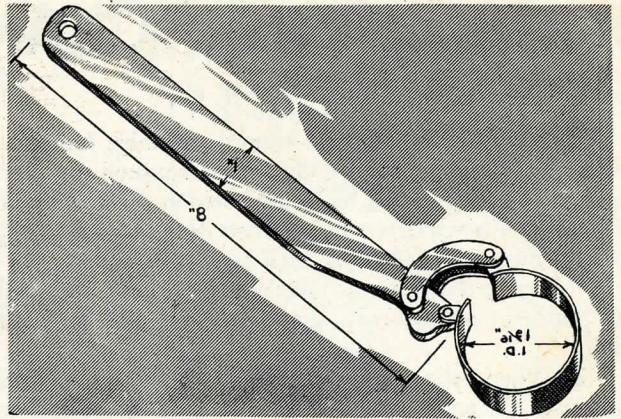
5. Disconnect electric solenoid meshing cable from bell crank.

6. Remove remaining hold down bolts from accelerating motor.

7. Remove accelerating motor by gently lifting up and to the rear.

8. Remove starter hold down units.

9. Remove starter.

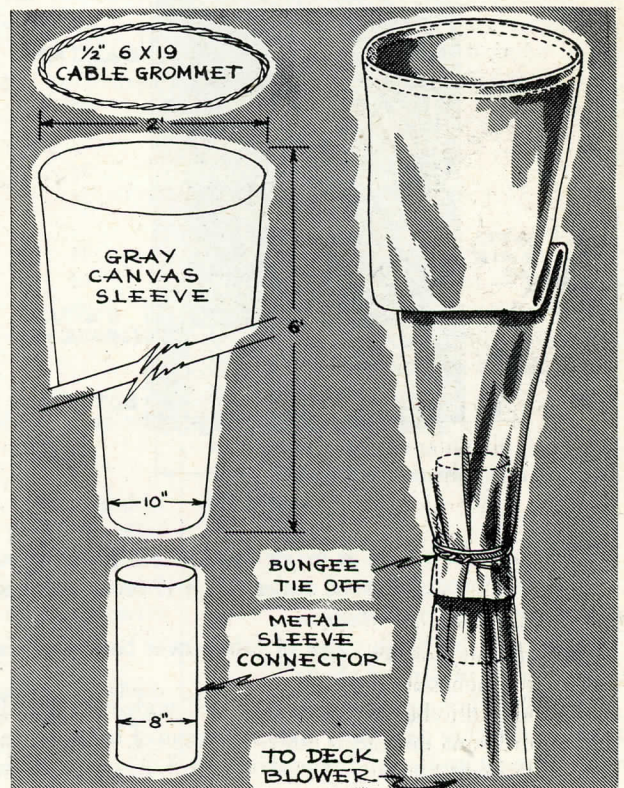


### HELIUM VALVE ADJUSTING WRENCH

The type of wrench shown above is used by the A & R dept. at Moffett Field for adjusting the helium valve. This type of wrench has prevented the adjusting knob from being scored from using a pair of pliers or any other type of non-standard wrench.

The material used is chrome molly for the handle and ordinary aircraft tubing for the clamp section.

Frank H. Russell, A & R Dept., Moffett Field



### AIRLINE SLEEVE

The above sketches illustrate a simple means of preventing collapse of internal suspension access sleeves while cable tensions are being adjusted. As indicated, the unit is simply a deck blower air nozzle designed to rest, by means of a wire grommet at the discharge end, on the external suspension cables directly under each internal sleeve. These conical sleeves are of sufficient diameter to allow a rigger to work on the cable without interference from such an air nozzle.

Williams, L. H., AM1c; ZASU-33



# HEDRON THREE

## HI-LIGHTS OF CHANGES AND BULLETINS

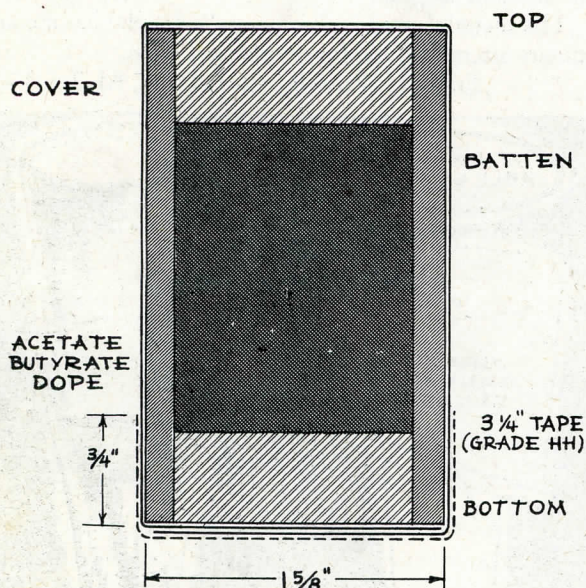
### BUREAU CHANGE #135

This change provides for a more servicable finish on batten fabric to prevent deterioration of cloth on nose battens. This change, shall be incorporated at the first major overhaul, or when deterioration exists in the batten fabric, in which case the following shall be complied with.

1. Battens showing superficial signs of weathering shall be brushed with two coats of aluminized acetate butyrate dope.

2. When fabric has blistered, lifted at seams, or is seriously effected by absorption of wax, the fabric should be stripped from the battens and the finishing procedure carried out starting with wood sealer.

3. In cases where wood is not in a good state of preservation, new type battens should be installed. These battens will be identified by the aluminized dope instead of gray lacquer.



The procedure used at major overhauls is as follows:

1. Brush 2 coats of wood sealer AN-S-17 on all battens and the retainer strips thereon.

2. Secure the finish cover of fabric over battens with clear dope as illustrated above.

3. When thoroughly dry add a 3 1/4" wide tape (H-H cloth) and secure with clear dope to bottom of battens as a reinforcement and extend approximately 3/4" up on both sides and completely cover forward end of batten.

4. Brush on 2 coats of clear dope (AN-D-1) on fabric and rub in to secure complete penetration.

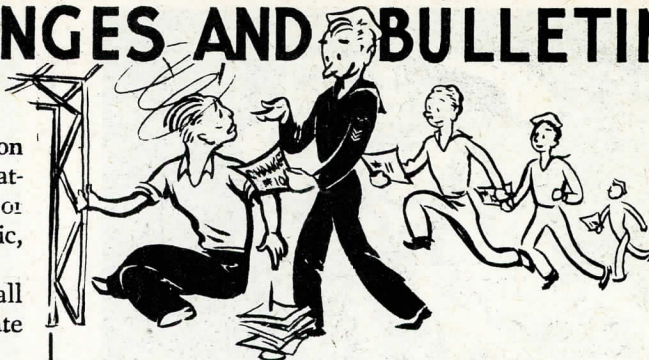
5. Spray on 1 coat of clear dope.

6. Spray on 1 coat of aluminized dope and when dry, sand lightly.

7. Spray on 1 finish coat of aluminized dope (M-585).

8. Nail retainer strips to battens with Packerized and cement coated nails (AC-301-20-5) spaced at two inches apart.

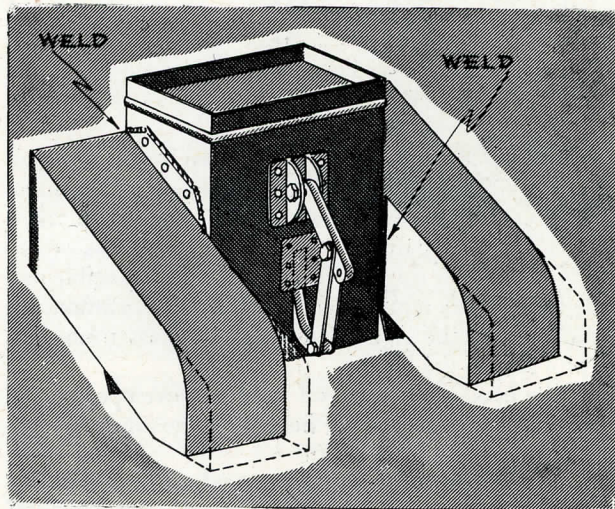
9. Apply two spray coats of aluminized dope (M-585) to retainer strips.



### BUREAU BULLETIN NO. 124 REFACING 36in. AIR VALVE SEATS

On major overhauls of K-type Airships at Moffett Field, badly corroded 36in. air valves were rendered fit for further service by the following procedure;

The valve seat and immediate adjoining area were sand blasted. This area was then built up with metal spray and ground true by means of a valve seat refacing unit, and finished with two coats of chromate primer. The refinished valve seat was true within plus or minus .005 in.



### BUREAU CHANGE NO. 128

To prevent gasoline fumes from leaking into the engine Nacelle—this change involves modifying assemblies by welding the warm air duct to the body as illustrated, and in addition, by lengthing the hole for the backfire door lever arm, 1 and 1-16 in. on the lower side to provide for a new lever arm.

Install the new lever arm, and determine the amount of hole necessary to operate the lever, then close off the upper unused portion of the hole with an aluminum patch.

### BUREAU CHANGE NO. 134

In keeping pace with Heavier-than-Air activities, which have used the quick change engine units for sometime, Lighter-than-Air is incorporating a quick change assembly including engine mount and engine accessories. All wiring, tubing and controls of the unit to terminate in fittings at the plane of the engine mount ring.

This not only saves time and simplifies the operation of changing engines but would give inexperienced personnel an opportunity to become experienced with the setting up of the quick change units between actual engine changes.



# HANGAR CHATTER

## HOW TO INSPECT SHEAVES USED WITH WIRE ROPE

**P**ROPER INSPECTION of wire rope must necessarily include examination of the equipment on which it is being used. In the majority of instances the cause of abnormal deterioration of wire rope is to be found in the machinery on which it is operating.

The principal items to be checked are:

1. Sheaves
2. Drums
3. Reeving
4. General operating conditions

### Sheaves

Points to be checked on sheaves are:

1. **Size.** Measure the diameter of a sheave from bearing surface to bearing surface, not from flange edge to flange edge, because it is the radius of the bearing surface that governs the degree of bending to which the rope is subjected as it travels over the sheave. Table I gives the recommended and the minimum sheave diameters for various constructions of rope. (These recommendations apply to drums as well as sheaves.)

Since the rate of fatigue of wire rope is governed very largely by the radii of the bends which it must take in normal operation, it is extremely important that the recommended diameters be equaled or exceeded. A large amount of internal wear is caused by improper sheave (and drum) diameters, since the radial pressure on a wire rope increases in inverse proportion to the radius of the bend. As the radial pressure increases a crushing action takes place in the rope, which increases internal friction and causes nicking of one inside wire by another.

2. **Sheave Grooves.** The diameter of the bearing grooves of sheaves (and drums) must bear a certain definite relation to the diameter of the wire rope used in it. See Figure I. As a rope passes constantly over the sheave, the groove is worn deeper and its diameter becomes constantly smaller until it is less than that of a new rope of listed diameter. When a new rope is placed in such a groove it will be forced down into the groove and be pinched out of shape. Hence, it will be subjected to extreme conditions of abrasion against the sides of the groove. Also, it will be

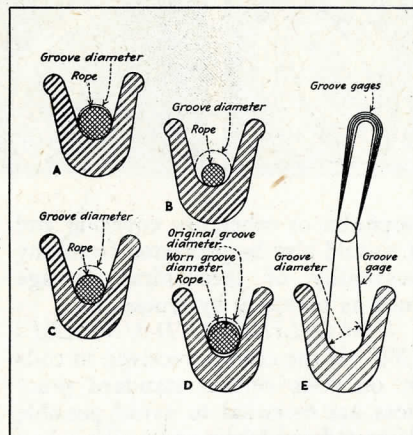


Figure I. Grooves should support a wire rope for nearly one-half its circumference, as in A. When a groove is too large, B, the rope tends to flatten under tension. C, this groove has worn to the decreased diameter of the rope. D, a new rope in a worn groove will be inadequately supported. Use a groove gage, E, to check grooves.

**Table I. Recommended and Minimum Diameters for Sheaves**

Rope	Recommended Diameter No. Times Rope Diameter	Minimum Diameter No. Times Rope Diameter
6 x 7	72	42
6 x 19	45	30
6 x 30 (Style G)	45	30
6 x 37	27	18
8 x 19	31	21
18 x 7	51	34

forced out-of-round and therefore will become unbalanced.

On the other hand, a rope placed in a sheave groove of too great diameter will not be afforded proper support. Such a condition tends to allow the rope to flatten out as radial pressure is applied to it.

The ideal condition is that in which the wire rope receives support from the sheave groove around just less than one-half of its circumference. The rope is thus allowed freedom of action with a maximum of support. Gages for measuring sheave grooves can be obtained from any wire rope manufacturer.

Table II gives the tolerances recommended for sheave grooves.

**Table II. Tolerance by Which Sheave Groove Diameter Should Exceed Rope Diameter**

Nominal Rope Diameter, Inches	Recommended Tolerance, Inches
1/4-5/16	1/64
3/8-3/4	1/32
13/16-1 1/8	3/64
1 3/16-1 1/2	1/16
1 9/16-2 1/4	3/32
2 5/16 and larger	1/8

3. **Sheave Materials.** Sheaves of too-soft material will be cut by wire rope, and their bearing surfaces will become corrugated to fit the contour of the rope used over them. This contour will not exactly conform to that of the next rope to be used over them; therefore the new rope will be cut and worn by the corrugations. Where such a condition prevails the sheaves should be re-machined or, preferably, replaced with sheaves of harder material.

Such corrugation will occur more readily if the sheave diameter is too small.

4. **Sheave Operation.** Defective bearings will cause sheaves to wobble or to revolve eccentrically and will thus set up a whipping action in the wire rope. Whipping will, of course, greatly increase the rate of fatigue and other deterioration of the rope. Such a condition should be corrected immediately.

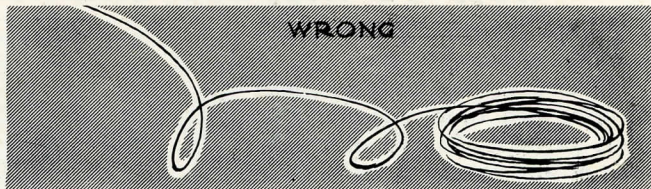
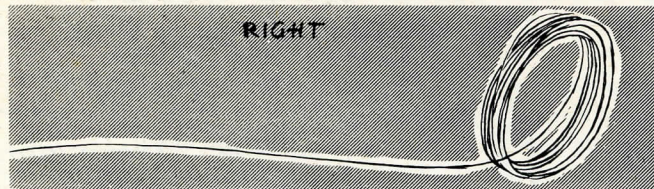
5. **General Sheave Conditions.** A sheave that is out-of-round or has a flat spot on its bearing surface will also cause whipping of the rope and must be repaired immediately. Sheave grooves should be either machined or ground to a smooth and true surface and contour.

When a sheave flange is broken off the wire rope may jump this flange and cause serious damage both to the rope itself and to the machinery. If the rope does not jump the flange, it is at least likely to come in contact with the sharp edges of the broken flange, which may gouge it badly. Such sheaves should be replaced without delay.



# HEDRON THREE

## MAINTENANCE OF CONTROL CABLES



**A**IRCRAFT control cords and cables can be defined as machines which are built to precise specifications to do specific jobs under widely varying and extreme conditions. They are composed of many moving parts designed to bear definite relationships to one another, and each one to perform its particular and proportionate share of the work.

Therefore, to obtain maximum efficiency, economy and safety from these machines, it is necessary to maintain them in good condition so that the original characteristics built into them will be preserved.

As is the case with other machinery, control cords and cables should be subject to certain specialized maintenance practices.

**STORAGE.** Whether the cord is received by the user in the form of continuous lengths packed in coils or on reels, or whether it be already cut and manufactured into assemblies, it must be properly stored so as to avoid possible damage before use. Aircraft cord as manufactured is lubricated adequately for immediate use. However, when it is received from the factory, examine it carefully to ascertain whether in transit there has arisen possible need for additional lubrication or for further protection in storage. Especially if the storage period is to be a long one, the cord should be covered with a good grade of oil or grease which contains no materials which will be injurious to the metal. It then should be assigned to a dry space where it is not exposed to the weather and where no potentially corrosive conditions, such as acid fumes, etc., exist. Do not store in space which has formerly housed corrosive chemicals. The corrosive effects may persist even though the chemicals have been removed a long time. It should be covered with a

tarpaulin or other dry covering and it should also be protected from any possibility of mechanical damage such as bumping by trucks, etc.

**UNCOILING AND UNREELING.** If the cord is received in coils or on reels certain standard practices are essential to avoid possible damage from kinks and twists when it is uncoiled or unreel. In uncoiling, free one end of the cord and then roll the coil along the floor away from that end in the manner of a hoop. *Never* lay the coil on the floor and pull off the cord loop by loop. This practice will almost certainly result in kinks or twists.

If the material is received on reels, pass a bar through the center of the reel and secure the bar in a horizontal position on stands so that the reel is free to revolve. Then pull the cord off from the reel, taking precautions that there is enough braking action on the reel to prevent its running ahead of the rate of pull-off. *Never* lay the reel on its side and pull the cord over the flange loop by loop. Kink and twist damage resulting in short service is very apt to develop from this practice.

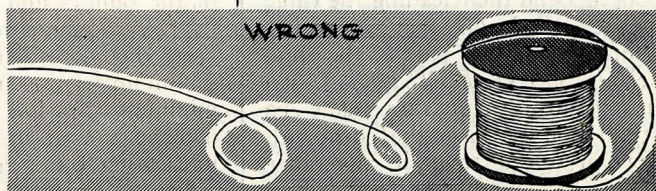
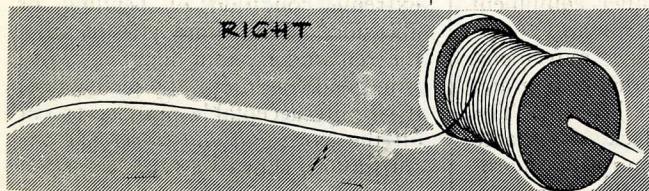
When handling a cord, either to pull it off a reel or into place on a plane, it is easy to put a permanent "set" or bend in the cord by wrapping it around the hand in order to get a better grip. Always keep the cord straight; if necessary to get better traction, increase the points of contact. *Never* subject the cord to sharp bends!

**INSTALLATION.** During installation it is particularly necessary to avoid kinking or twisting the cord. As the cord is put into place, make sure that one end is free to revolve at all times so that all twisting and untwisting to which the cord is subjected during handling will be released. As it is led into place care must be taken that it is not scrubbed or gouged against any other part of

the machinery. Every precaution should be taken to protect the individual wires from damage. Avoid forcing cord and assemblies into place; properly designed assemblies will almost always go into place without the necessity for straining and forcing them.

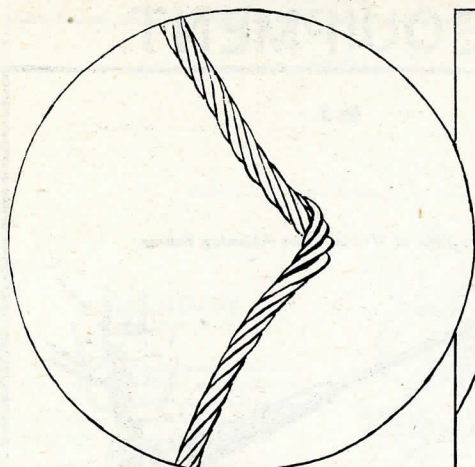
**CUTTING AND ATTACHING FITTINGS.** It is necessary at all times to avoid kink damage to the cord. Therefore, in preparing to cut lengths from the reel or coil, be certain that no kinks and twists are thrown into it. Also be careful that the individual wires are not damaged or distorted nor subjected to undue abrasion when pulling the cord from one workbench to another. The individual wires in an aircraft control cord or cable are extremely small in diameter and if the cord is pulled roughly against sharp objects or around acute bends, permanent damage will be done.

There are three means of cutting aircraft cord: (1) shearing; (2) using an abrasive wheel; and (3) the electric cutoff. The means used will, of course, depend on the equipment available. However, shearing is generally the least desirable since, even with carefully designed shears, it flattens the cord at the point of the cut and distorts to a greater or lesser degree the strands and the individual wires. Use of the abrasive wheel produces a much cleaner, sharper cut than does shearing and, consequently, is more desirable. In the event the cord is being cut for the purpose of making a splice, a mechanical cut, such as that made by the abrasive wheel, leaves the wires loose so that they can be separated easily. If, however, the cut is being made to allow a swaged fitting to be attached, the electric cutoff method is desirable, since it not only produces a clean cut but fuses the wires together which facilitates insertion of the cord into the hole



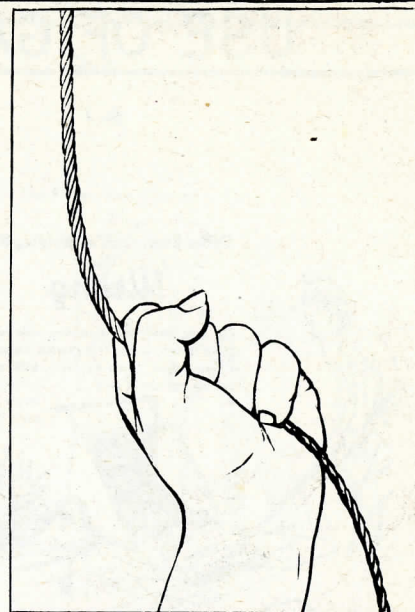
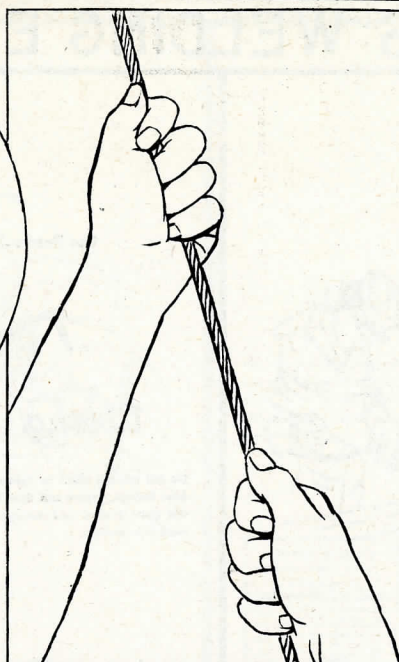


# HANGAR CHATTER



**Badly kinked aircraft cord. Distortion of individual wires and strands resulting from such a kink can never be corrected.**

**Proper method of handling. Always keep cord straight and avoid bends made by hands or tools.**



**Such a grip may easily put a permanent bend in the cord.**

of the fitting.

When using the electric cutoff, certain precautions are necessary. (1) Keep the contact jaws which grip the cord clean and bright at all times. (2) Handle cord through guides and keep it away from the grounded part of the welding machine as well as from any other grounded metal. The fine wires in a cord are extremely susceptible to electrical burns such as will result from unintentional contacts as above. A wire thus burned will break upon slight bending.

## **PULLEYS AND FAIRLEADS.**

A potential source of excessive wear to an aircraft control cord is in the equipment over which it is used. Careful periodic checks must be made of the surfaces of the grooves of the pulleys over which it operates. Any corrugation or roughness will constitute a source of excessive abrasion and should be corrected. The surfaces of the fairleads must also be smooth and offer no source of undue abrasive wear.

The bearings of the pulleys should be checked frequently both for their lubrication and general condition. Any wobble or eccentricity in the operation of the pulley will induce higher friction in the system and other potential sources of damage to the cord. The alignment of the pulleys must be checked regularly also so as to avoid their leading the cable in such direction that it scrubs against some other part of the ship.

**ADJUSTING TENSION.** When tension adjustments are made be careful not to grasp the cord with pliers or to subject it to any other abuse which might injure the indi-

vidual wires and disrupt their original relationship by twisting or otherwise distorting them.

In adjusting tension, it is most desirable that a standard and approved type of tensiometer be used, since accurate readings of adjustment can be made and the cord will thus be used under the most efficient tension. However, in applying the tensiometer, due care must be taken that the cord is not twisted or subjected to unnecessary abuse as machine is being applied and removed.

**LUBRICATION.** Aircraft control cord needs to be protected adequately at all times from the effects of the weather and the elements. When a cord is taken out of storage and placed into operation, wipe off the excess storage lubricant with a clean dry cloth, and replace it with a light adhesive oil which is non-injurious to the metal, but which is effective and efficient under extremes of temperature and during normal mechanical operation of the cord. Excess of this latter lubricant also should be wiped off to prevent it from picking up dirt and grit which will act as an abrasive to the cord during normal operation. Operation lubricant should be replenished as frequently as service and cord conditions warrant. It is well during the inspection of lubricant on the cord itself to inspect that of the pulleys and other equipment over which the cord operates to assure their freedom of movement, minimum friction in the system and minimum abrasion to the cord. The damage caused by lack of suitable lubrication often requires a microscope to make it visible but it is

just as destructive to good service as though it were readily seen.

**INSPECTION.** Regular inspection of aircraft control cord should look for evidence of corrosion, distortion, abrasion and broken wires. Good practice will indicate when abrasion and broken wires have reached serious enough proportions to warrant removal of the cord, but when there is evidence of any corrosion or distortion, the cord should be removed immediately. Particular care should be taken in inspecting sections of the cord which pass over pulleys and fairleads even though such thorough inspection necessitates loosening one end of the assembly so that all sections of the cord may be seen.

Since service conditions for control cord vary widely from one locale to another, and since safety standards vary somewhat in accordance with the original factor of safety present when the cord was first installed, no definite end point of the number of broken wires and extent of abrasion at which cord should be removed can be set to cover all conditions.

**SALVAGE.** It sometimes will occur that abrasion and broken wires will be concentrated at one end of the assembly where there is an extreme condition of bending or abrasion. It is quite possible that the remainder of the length of cord is in good condition. In such a case, it is quite acceptable practice to cut off the worn end and to remake the cord into a shorter assembly for another job.



# HEDRON THREE

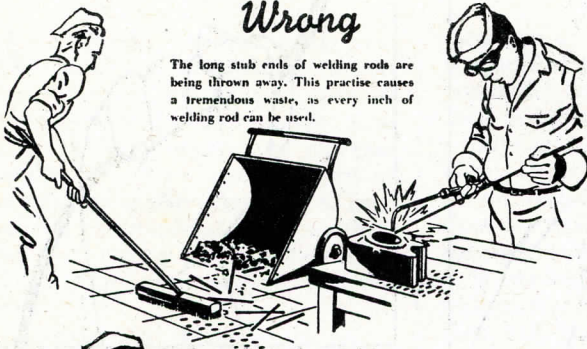
## USE OF GAS WELDING EQUIPMENT

No. 1

Utilize Every Inch of Welding Rod

**Wrong**

The long stub ends of welding rods are being thrown away. This practise causes a tremendous waste, as every inch of welding rod can be used.

**RIGHT**

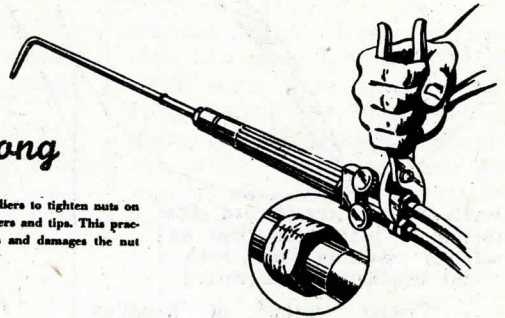
The entire length of welding rod is utilized by "tacking" a new rod on the end of the stub. The stub ends of rods less than  $\frac{1}{8}$  inch in diameter, can be collected during the work shift and "tacked" into long rods later on.

No. 2

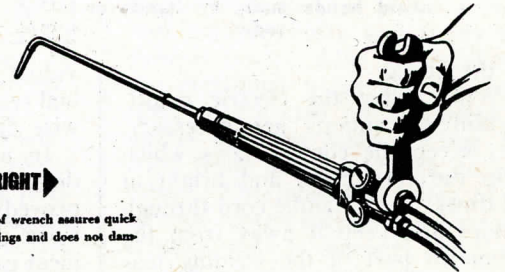
Use Proper Type of Wrench When Adjusting Fittings

**Wrong**

Do not use gas pliers to tighten nuts on hose fittings, mixers and tips. This practise quickly scars and damages the nut until it is useless.

**RIGHT**

The proper type of wrench assures quick adjustment of fittings and does not damage them.

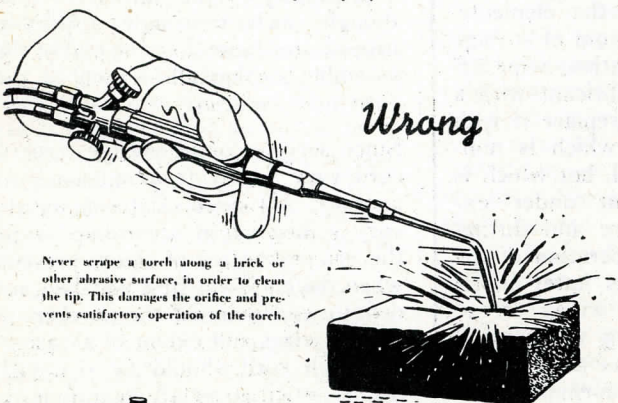


No. 3

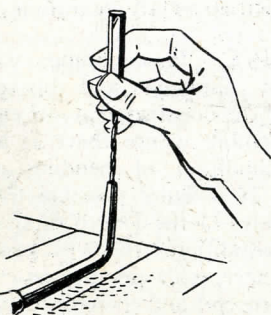
Clean Tips Properly

**Wrong**

Never scrape a torch along a brick or other abrasive surface, in order to clean the tip. This damages the orifice and prevents satisfactory operation of the torch.

**RIGHT**

Tip is being cleaned with the proper size drill, so that the tip is thoroughly cleaned and the orifice is not damaged. Do not twist the drill—move it in and out. Never use an over-size drill, or try to enlarge the orifice.

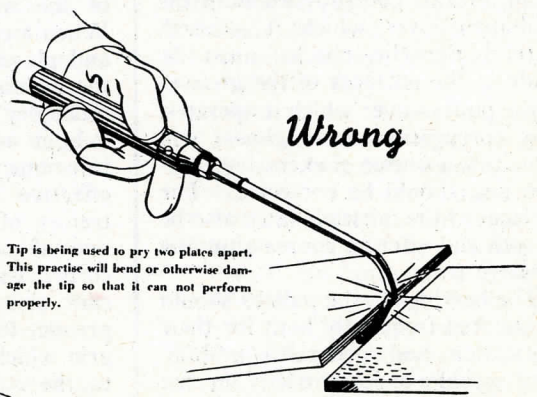


No. 4

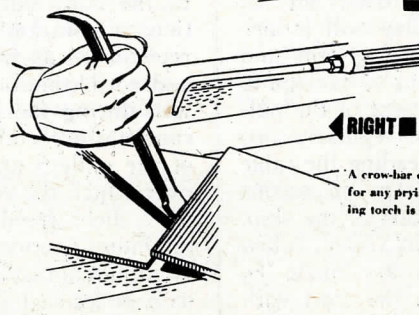
Do Not Use Torch as a Hammer or a Lever

**Wrong**

Tip is being used to pry two plates apart. This practise will bend or otherwise damage the tip so that it can not perform properly.

**RIGHT**

A crow-bar or other lever should be used for any prying or similar work. The welding torch is kept out of the way.



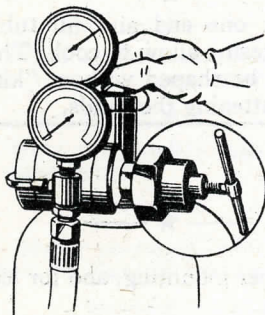
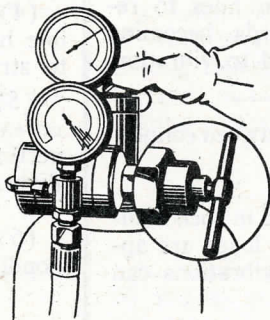


No. 5

## Release Regulators Before Connecting

*Wrong*

Gas pressure is being applied before the regulator adjusting screw is backed out. This surge of pressure on the regulator will very likely damage the gage and internal mechanism of the regulator.

◀ **RIGHT**

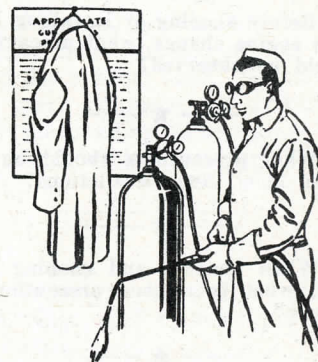
Regulator adjusting screw is fully backed out before the gas pressure is applied. This prevents excessive pressure being introduced into the low pressure section of the regulator.

No. 6

## Use the Proper Gas Pressure

*Wrong*

The operator is endeavoring to adjust the gas pressure at the torch valves instead of at the regulator. This practice wastes gas, produces backfires and causes poor workmanship.



## APPROXIMATE GUIDE FOR GAS PRESSURE

◀ **RIGHT**

Operator is carefully adjusting the gas pressure at the regulator, according to the recommendation of the equipment manufacturers.

Sketch 1—shows how every inch of welding rod can be easily utilized. There is no need for throwing away stub ends. The stub ends of rods larger than  $\frac{1}{8}$  inch in diameter can be easily "tacked" on the end of a new rod, with little waste of time and resulting in a tremendous saving of rod material. When using smaller diameter rods it may be advisable to save all the stub ends until the end of the shift, at which time a welding helper can quickly "tack" them into several long rods ready for use by the operators of the next shift. In any event, the stub ends should never be thrown away.

Sketch 2—illustrates an abuse that may appear at first glance to be too elementary for consideration by a gas welding operator. The fact remains, however, that in almost every shop hundreds of gas welding and cutting equipment fittings are made useless simply because the operators insist on tightening fitting nuts with pipe wrenches or gas pliers, rather than search for an appropriate type of end wrench. Soon these nuts become so scarred and damaged that it is almost impossible to make a tight fit. The proper type of end wrenches should be made easily available to all gas welding operators, so that there will be no incentive to use the wrong type of tool for tightening the nuts on hose fittings, mixers and tips.

Sketch 3—indicates a very common abuse, namely, rubbing a burning torch across the floor, or over a brick or some other abrasive surface in order to clean the tip. It is obvious that such a procedure will very quickly damage the orifice of the torch, so that it will be impossible to get the proper type of flame and do good workmanship. Torch tips should be cleaned by using a drill of the proper size made for this purpose. This drill should be worked in and out of the tip, not twisted. Moreover, an oversize drill should never be used, either for cleaning or in an effort to enlarge the orifice of the tip.

Sketch 4—shows what is certain to happen when a torch is used as a pry or lever. This is one of the easiest and quickest ways to ruin a torch and it should never be used for even the lightest type of prying work. Keep a small crowbar or iron handy for this type of work.

Sketch 5—illustrates how easy it is to damage a gas regulator. When a regulator is put on a cylinder, make sure that the adjusting screw is entirely released (backed out) before gas pressure is applied to the regulator. If full of gas pressure is permitted to act on the low pressure stage of the regulator, the surge is very apt to hopelessly damage the gage and internal mechanism of the regulator.

Sketch 6—stresses the importance of using the proper gas pressure. The pressure should be adjusted at the regulator, not by means of the torch valves. Use the pressures recommended by the equipment manufacturers, for the type of work being done. Excessive pressure not only wastes gas, but also slows down and impairs the quality of the work being done.

**DON'T KEEP YOUR  
IDEAS TO YOURSELF!  
SEND THEM IN!**



# HEDRON THREE

## LUBRICATION SYSTEMS

### Questions

### Answers

#### OIL LINES

a. Before shaping or installing lines after engine change, what precautions should be observed?

— ★ —

b. What precautions should be observed in oil line installations?

— ★ —

c. When bending and shaping new lines, what is a good precaution to observe?

— ★ —

a. Anneal or soften lines to reduce tendency towards becoming brittle when subjected to vibration.

— ★ —

b. (1) No splices between connections.

(2) Lines supported in such manner that no structural loads are applied or undesirable vibrations can occur.

(3) Flexible connections at junction points, especially between engine and remainder of system.

(4) Provide ample length of flexible hose, when engine is attached to structure by flexible mount

(5) Bead or roll external groove on ends of oil lines within hose connections to prevent separation during flight.

(6) Bridge connections with radio bonding.

— ★ —

c. Cork one end and fill tubing with hot resin; allow to cool. Thus, lines may be shaped without "kinking" or flattening the bends.

#### OIL TANKS

a. When should the oil tank be thoroughly cleaned? Why?

— ★ —

b. What do you check in an oil tank inspection?

— ★ —

a. At every engine change and when oil foaming occurs. Foreign material might dry and flake while tank is empty; then go into circulation as soon as engine is operating again, clogging important passages and causing damage.

b. Proper mounting, and for leaks and dents.

— ★ —

#### OIL COOLERS

a. Is submerging of the oil cooler in the cleaning solution a recommended cleaning practice? Why?

— ★ —

b. What is the correct procedure for cleaning the oil cooler?

— ★ —

c. What is the reason for using an oil temperature regulator in the system?

— ★ —

d. How would you test an oil cooler for leaks?

— ★ —

a. Never submerge it in cleaning solution. The foreign matter is only loosened but not removed.

— ★ —

b. Circulate the cleaning fluid through the radiator for a considerable length of time with provision made for the material to settle into a special compartment.

c. To keep the operating temperatures within certain limits in order to control viscosity of oil for proper lubrication.

— ★ —

d. Submerge the unit in water and apply an internal air pressure of approximately 15 to 20 pounds per square inch.

— ★ —

#### OIL PUMPS

a. How is the operating oil pressure, recommended by the manufacturer, controlled in an oil pump? How would you adjust it?

— ★ —

b. What is the cause of a pump rotating but failing to pump oil in a newly overhauled engine?

— ★ —

c. In checking a gear pump to determine if it will continue to deliver the desired pressure and volume, what would you inspect?

— ★ —

a. The tension on spring in pressure relief valve controls pressure. It is adjusted by changing thickness of washers under relief valve body. Remove washers to increase pressure and add washers to decrease pressure.

b. The pump has no prime.

— ★ —

c. The gear teeth clearance with the case and gear teeth mesh.

— ★ —



**Questions****Answers****TROUBLE SHOOTING**

a. What are possible causes of excessive oil temperature?

— ★ —

b. What are possible causes of too low oil temperature?

— ★ —

c. What are possible causes of high oil pressure?

— ★ —

d. What are possible causes of low oil pressure?

— ★ —

e. What are possible causes of complete loss of oil pressure?

— ★ —

f. What are possible causes of high oil consumption?

— ★ —

g. During operation, what are indications of high oil consumption?

— ★ —

h. What lubrication factors are causes of detonation?

— ★ —

i. What lubrication factor is the cause of engine failure to develop full power?

— ★ —

j. What lubrication factor is the reason for warming-up engines before take-off?

— ★ —

k. In flight, what will cause the oil pressure gage to suddenly register a drop of about 20 to 25 pounds per square inch and then remain constant?

— ★ —

l. What is the first thing to do when the oil pressure gage needle fluctuates and picks up, then drops to zero?

— ★ —

m. What may cause continuous and excessive fluctuation of the oil pressure gage needle?

— ★ —

n. What effect would excessively worn master rod bearings have on the lubricating system?

— ★ —

o. What will improper scavenging of oil cause?

— ★ —

p. With an adequate oil supply, proper lubrication will be indicated by correct readings of what two instruments?

a. Insufficient oil supply, diluted or contaminated oil, insufficient oil cooling capacity, improper viscosity or grade of oil, and prolonged overheating of engine.

— ★ —

b. Insufficient or no lagging of oil system in cold weather, engine not properly "warmed up," defective temperature gage, and insufficient heating of oil in tank in cold weather.

— ★ —

c. Oil temperature too low, oil pressure relief spring tension too great, oil viscosity too high, and defective pressure gage.

— ★ —

d. Oil supply exhausted, oil too low in viscosity, plug out of pressure system, defective gage, oil temperature too low, pressure relief valve sticking open, worn or defective pump, pressure relief spring tension too low, and worn bearings in the pressure system.

— ★ —

e. Plug out of pressure system, oil supply exhausted, broken oil pressure line, failure in pressure system structural part, broken pump, and pressure relief valve sticking open.

— ★ —

f. Oil pressure too high, oil temperature too high, oil viscosity too low, improper functioning of scavenging pumps and system, worn connecting rod bearings, worn or defective supercharger oil seals, cracked induction housing oil chambers, and oil leakage in the system.

g. Blue smoke from exhaust, especially after the engine has been idled for a short time. Sometimes, the spark insulators or points are short circuited by oil and cause fouling or misfiring of the plugs.

— ★ —

h. Improper lubrication of pistons, rings, and cylinders; and too low viscosity oil.

— ★ —

i. Improper lubrication.

— ★ —

j. To warm the oil and obtain proper operating temperature.

— ★ —

k. Carbon or other foreign particles lodged between oil pressure relief valve and seat.

— ★ —

l. Check the quantity of oil in the tank.

— ★ —

m. An air leak in the pressure line.

— ★ —

n. High oil consumption.

— ★ —

o. A smoking engine.

— ★ —

p. Oil temperature and oil pressure gages.



**Questions****Answers****PRECAUTIONARY MEASURES**

a. Why should precautions be taken that too light an oil should not be used in a blimp lubrication system?

b. What precaution should be observed after each oil change?

c. Why should extreme care be taken in selecting, cleaning, and changing oil?

d. Why is cleaning of the lubrication system extremely important?

e. How would you prevent congealing of the oil with consequent damage to the engine during winter operation of engines not provided with suitable temperature or viscosity control systems?

f. What lubrication system items should be checked in pre-flight inspection?

g. What are the reasons for using heavier viscosity oil in aircraft than in automotive engines?

h. Where are engine oils having a low pour point used?

i. What precautions can be observed to pre-determine internal engine failures?

j. What is a most important factor in controlling the amount of oil reaching the engine combustion chamber?

k. When starting an engine, what is the first engine instrument you would check?

l. The use of too heavy an oil will be indicated in what way?

m. What is the purpose of the magnetic plug in the oil sump of an engine?

n. Why should a vegetable lubricant such as castor oil not be used?

a. (1) Would not maintain an oil film for proper lubrication.

(2) Would be consumed in large quantities in the cylinder as it passed the piston, due to large clearances between piston and cylinder wall.

b. Fully safety or lock the drain caps.

c. Due to its circulation through the engine crankcase, oil is subjected to many conditions: temperature, pressure, condensation, evaporation, centrifugal force, chemical changes, etc.

d. Oil filters and oil passages clogged with sludge, combined with carbon particles and dust, have caused engine stoppages

e. Lag or cover with shredded asbestos or felt the oil tank, lines, and sump. Make the shredded asbestos plastic by mixing with water so that it can easily be pasted on the surfaces and then cover with fabric tape soaked with airplane dope to hold lagging in place.

f. (1) Examine carefully for loose or leaking oil line connections.

(2) Sufficient oil supply for operation.

(3) Check oil pressure and oil temperature for normal operation.

g. Higher cylinder pressures, higher operating temperatures, greater bearing loads, and wider clearances between parts.

h. For operation in excessively cold climates.

i. Check magnetic drain plugs and deposits left on oil sump screens for metallic particles.

j. Oil control ring.

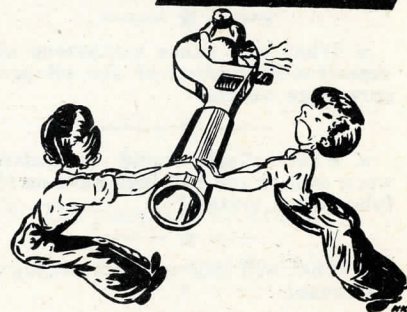
k. The oil pressure gage.

l. A rise in oil temperature and a drop in oil pressure, due to oil pumping difficulty.

m. To remove any material in the oil subject to magnetic attraction.

n. It has a tendency to oxidize when exposed to the air.

**SAVE LIVES  
SAVE TOOLS  
SAVE TIME**



**USE PROPER WRENCH ON  
ALL NUTS & FITTINGS**



# HANGAR CHATTER

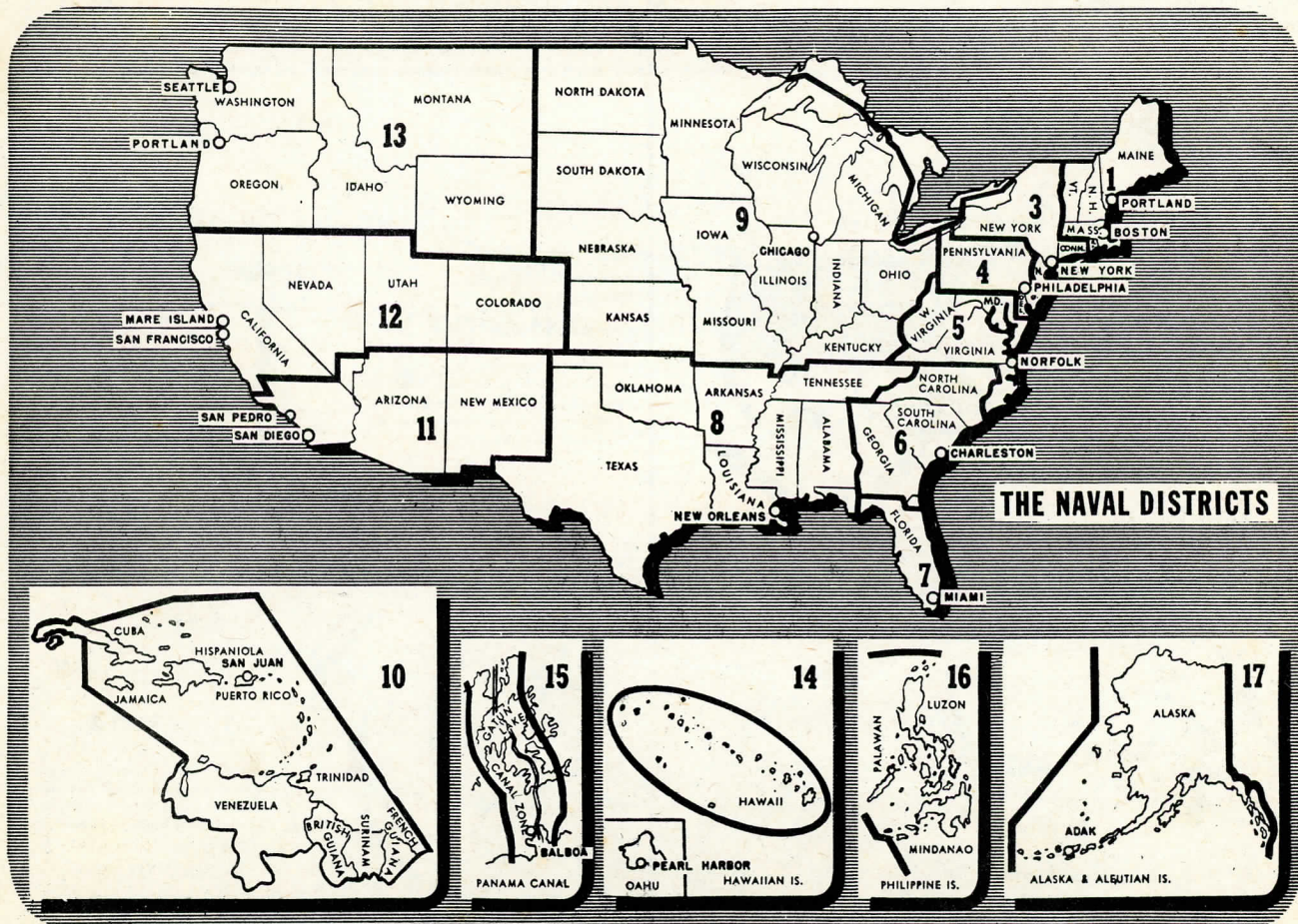
## OPERATING LIMITS FOR PRATT & WHITNEY R-1340 ENGINE

For the benefit of men striking for a mech's rate, the following table is the recommended operating limits of the Pratt & Whitney R-1340 engine; the type used on a K type airship. Clip it out and save it.

Operating Condition	Eng. R.P.M.	Manifold Pressure (Max.-Hg.)	Mixt. Control Position	Carb. Air Temp. (C)	Oil Inlet Temp. (C)	Cyl. Hd. Temp. (Max. C)	Oil Pressure
STARTING	500-600 in-1 Minute	—	FULL RICH	FULL COLD	—	—	Press. Must Show in 30 secs.
WARM-UP	900—1000	—	FULL RICH	FULL HOT	—	—	50-(Min.)
GROUND TEST	—	30	FULL RICH	40°	40° (Min.)	150°	70-90
TAKE OFF	1700	34	FULL RICH	FULL COLD	40°	150°-210°	70-90
CRUISING	1200	19-21	LEAN	40°-50°	60°-90°	160°-180°	70-90
LANDING	Variable	Variable	FULL RICH	40°	40°-90°	150°-180°	20-90
STOPPING	800—1000	—	Idle-Cut-Off (Full-Lean)	FULL COLD	—	150°	10-(Idling Min.)
MAX.-MIN.	—	12-36	—	0°-60°	40°-90°	150°-210°	20-90

FUEL PRESSURE SHOULD ALWAYS BE BETWEEN 3 TO 5 LBS. PER SQ. INCH.

## THE SEVENTEEN NAVAL DISTRICTS



CLIP THIS MAP OUT AND SAVE IT



# HEDRON THREE

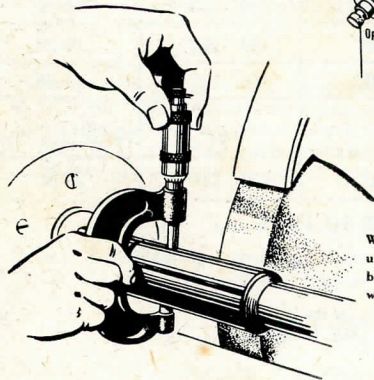
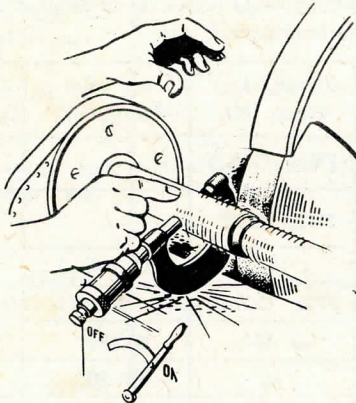
## MICROMETERS

No. 1

Do Not Measure Moving Parts

*Wrong*

Micrometer is caught in rotating work and yanked from operator's hand. Moving work will also wear down the measuring surfaces.



◀ **RIGHT**

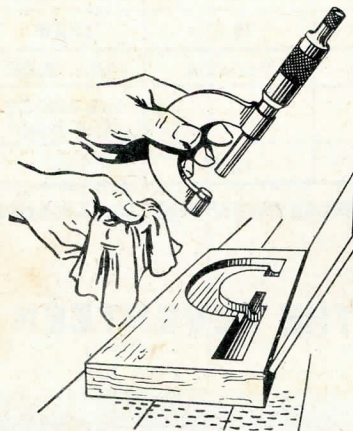
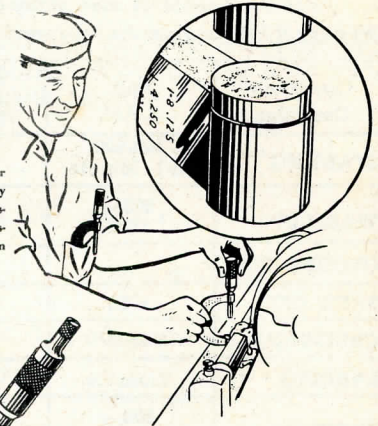
Work is stopped completely before measurement is taken. This avoids the possibility of the micrometer jamming on the work and being destroyed.

No. 2

Keep Micrometers Clean

*Wrong*

The dirt accumulation on this micrometer will work into the threads and destroy their accuracy, and will get on the measuring surfaces and give inaccurate measurement. Do not keep a micrometer in a dirty pocket.



◀ **RIGHT**

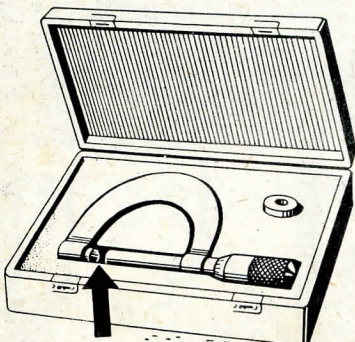
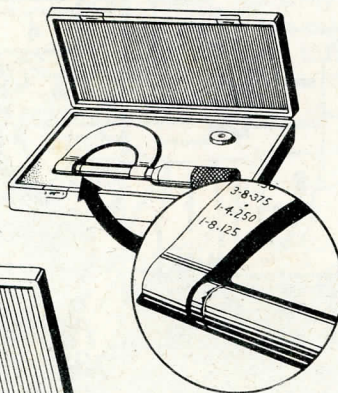
Micrometer is wiped clean with a soft cloth, then placed in a box where it is protected from grinding dust and other particles. Occasionally take micrometer apart and clean threads with a light oil. Lubricate with watchmakers' oil before putting together.

No. 3

Keep Surfaces Apart When Putting Away

*Wrong*

Measuring surfaces are tight together, so that any moisture on them will cause rust, even though the micrometer is put away in a clean box.



◀ **RIGHT**

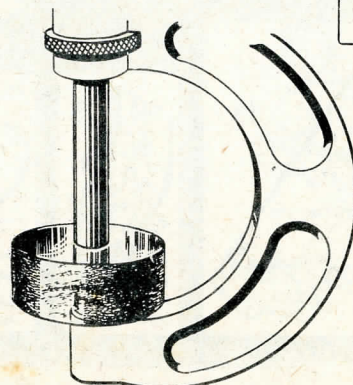
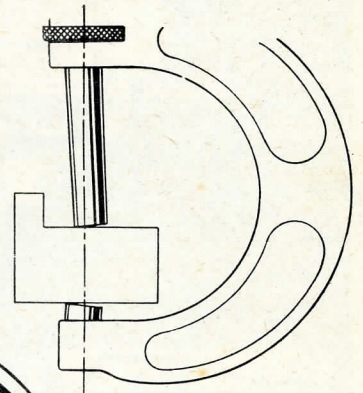
Micrometer is carefully wiped off and the measuring surfaces are left slightly apart before instrument is put away.

No. 4

Check Measuring Surfaces Regularly

*Wrong*

Measurement is being made with the measuring surfaces out of parallel. This will result in wrong measurement and ultimate reject of the part.



◀ **RIGHT**

The parallelism of the measuring surfaces is being carefully checked with a flat optical disc. A regular check of this sort will tell at a glance when the surfaces are out of parallel.

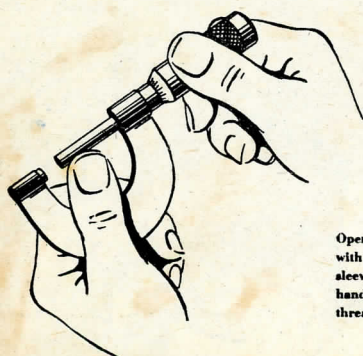


## No. 5

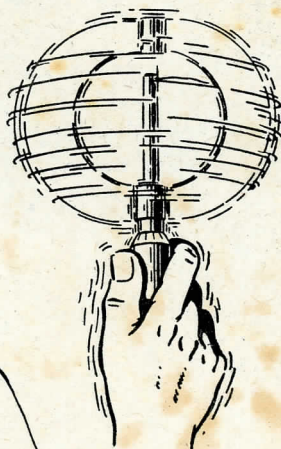
## Open Micrometer Properly

*Wrong*

Never open a micrometer by twirling the frame. This practice puts an unnecessary strain on the instrument and causes excessive wear of the threads.

◀ **RIGHT** ■

Open a micrometer by holding the frame with one hand and turning the knurled sleeve, or the ratchet screw with the other hand. In this way no strain is put on the threads.

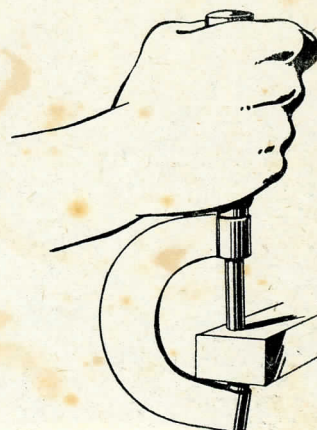


## No. 6

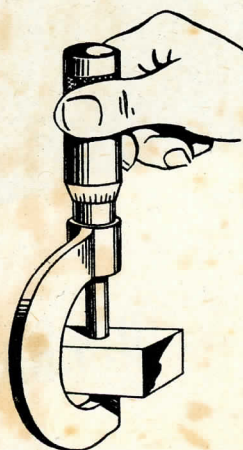
## Tighten Micrometer Properly

*Wrong*

Too much pressure is being applied to the micrometer, thereby springing the frame and forcing the measuring surfaces out of line.

◀ **RIGHT** ■

Moderate pressure is being applied to the micrometer, so that an accurate measurement can be taken. Always use the ratchet screw, if there is one on the instrument.



**M**ICROMETERS are one of the most widely used measuring instruments in industry. Nearly all plants producing war materials use them in large quantities, with the result that micrometers are scarce and broken ones are hard to replace. It is essential that these useful instruments be handled carefully and that every precaution be taken to assure their long and accurate life.

Sketch 1—indicates what is likely to happen if a micrometer is used to measure work that is in motion. By trying to measure a turning shaft, the micrometer may bind on the work and be whipped around probably damaging the instrument and possibly injuring the operator. After the machine is shut down, make sure the work has stopped rotating before a measurement is taken.

Sketch 2—stresses the importance of keeping micrometers clean. Any dirt or abrasive material will not only impair the accuracy of the measuring surfaces, but will also work into the threads of the instrument and cause excessive wear which will make the reading inaccurate. Do not let coolant solution flow over the instrument, as this will wash grit into the threads. The micrometer should be wiped clean with a soft cloth before it is put away. Occasionally take the micrometer apart and clean the threads with kerosene or a light oil. Lubricate the threads with a light watchmakers' oil before putting it together. It is advisable not to carry a micrometer in a pocket of your work clothes, as the dirt inside the pocket may work into the threads of the instrument.

Sketch 3—illustrates the advisability of keeping the working surfaces of a micrometer slightly apart when it is put away. If they are closed, any moisture on the surfaces will

cause them to rust as they lie unused in the box. It is better still to be sure and wipe the surfaces clean and dry before putting the instrument away.

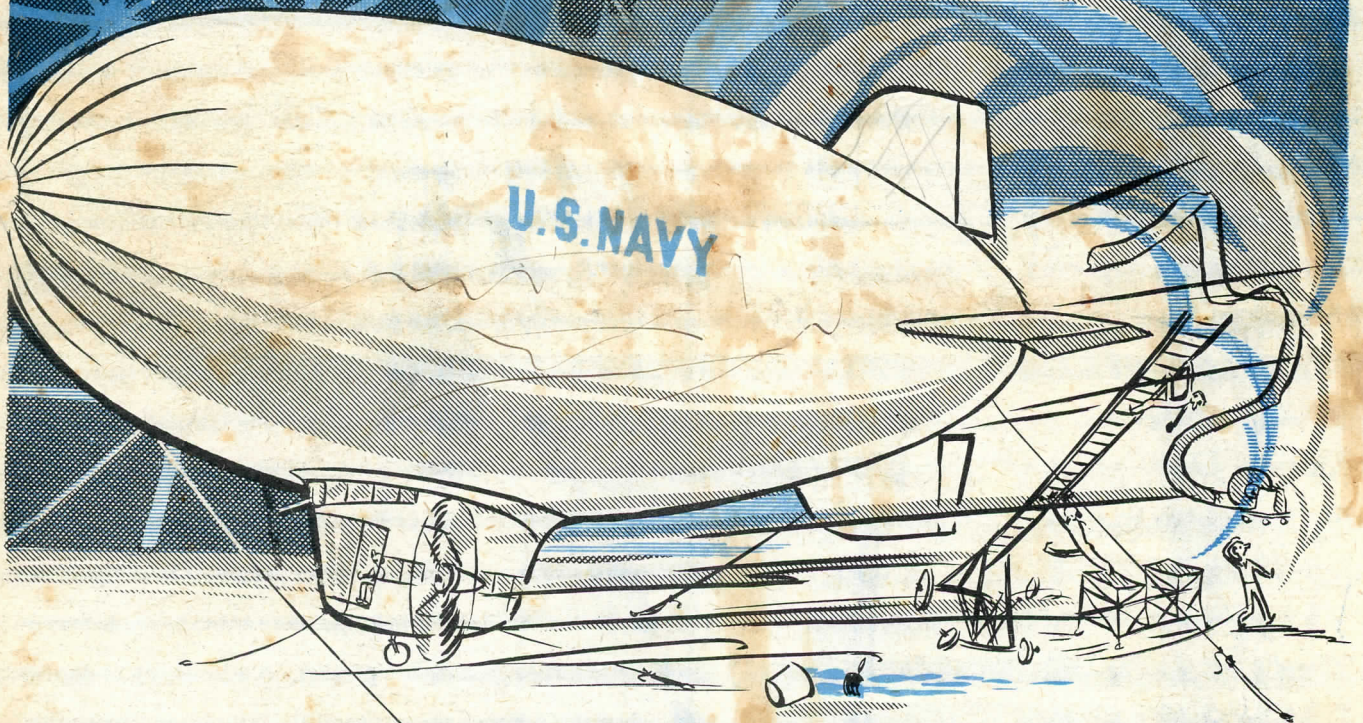
Sketch 4—shows by exaggeration how inaccurate measurements will result if the measuring surfaces are not parallel. This may be caused by the surfaces being worn out of parallel, or due to a spindle that does not fit tightly in the frame. Micrometer measuring surfaces should be checked occasionally to make sure they are parallel. A simple way to do this is by means of a flat optical disc, which shows at a glance when the surfaces are not parallel. This should preferably be done by an experienced man, either in the tool room or by carrying a portable test kit around to test all the micrometers.

Sketch 5—shows the common but erroneous practice of twirling a micrometer frame in order to open it. This puts a severe strain on the threads and moving parts of the instrument and will cause it to lose its accuracy more quickly than if handled properly. The spindle should be adjusted by holding the frame in one hand and turning the knurled sleeve, or the ratchet screw, if one is provided, with the other hand. In this way no strain is put on the instrument.

Sketch 6—stresses the fact that micrometers should never be used for clamps, or forced too tightly against parts being measured. This practice springs the frame and causes unnecessary wear on the threads and measuring surfaces. A micrometer used in this manner will very soon become inaccurate. Always apply a moderate pressure by means of the knurled sleeve, or use the ratchet screw if one is provided.



***TAKE A BEARING AFT-***



***BEFORE YOU REV HER UP!***